Think Academy

Jolly Math

Grade 4

Think Academy US ONLINE

Upper Elementary Math Program

Think Academy Elementary Math Program is designed for K to Grade 5 students, offering a professional, systematic, and comprehensive year-round curriculum based on North American learning standards. The program is divided into two main systems:**School Curriculum Track and Competition Track.**

- The School Curriculum Track is divided by students' progress and ability:
  - Core+：Aligned with school curriculum; with solid foundations and steady improvement
  - Honors：One year ahead; consistent A grades and readiness for accelerated programs
  - Challenge：1.5–2 years ahead; full mastery of AP-level math with moderate enrichment

1–2 years ahead of Common Core, aligning with both private school entrance exams (MAP, ISEE, SSAT) and public school assessments (STAR Math, i-Ready, IOWA, SBA, etc.), ensuring students maintain a strong academic edge.

- The Competition Track is divided by thinking flexibility and concept mastery:
  - ACE：Builds competition foundations, strengthens problem-solving skills, and helps Grade 5 students reach AMC 8 Honor Roll
  - ACE+：Intensive training for advanced Olympiad pathways and higher-level competitions

Covers core knowledge points from Math Kangaroo (Grades 1–4) and AMC 8 (Grades 4–8), develops both reasoning and competition skills, promoting excellence in school academics and contests for long-term growth.!

The tiered class structure ensures every student finds a fit. All cover the seven core modules of elementary mathematics—Computation, Geometry, Number Theory, Applications, Counting and Probability, Algebra, and Combinatorics—**with differences only in pace and depth.**

	Elementary School									Middle School		
Grade	G3			G4			G5			G6		
Semester	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
Core+	Math 3			Math 4			Math 5			Math 6		
Honors	G3 Honors			G4 Honors			G5 Honors			Pre-Algebra		
Challenge	G3 Challenge			G4 Challenge			G5 Challenge			Algebra 1		Intro to Geometry
ACE	G3 ACE			G4 ACE			G5 ACE			AMC8 HR		AMC10 Intro

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Middle School Competition Track Student Results

2022-2024 AMC8 Number of Students Awarded:

456
Achievement Roll
(Lower Grade Achievement Award)

397
Honor Roll
(National Top 5%)

134
DHR
(National Top 1%)

2022-2024 AMC10 Number of Students Awarded:

304
AIME Qualification
(National Top 7%)

187
Honor Roll
(National Top 5%)

45
DHR
(National Top 1%)

2024 Think Global IMO Award Winner

7 Golds 1 Silver

Ranked first globally in total gold medals.

International Mathematical Olympiad
Foundation Bronze Sponsor

Think Academy is an official partner of the International Mathematical Olympiad (IMO)

Why Think Academy Competition Courses Trained Thousands of Award-Winning Students?

1 One-Stop Professional System for Math Competitions

Think Competition follows the AMC syllabus and aligns with students' learning pace. **Grades 5–6 focus on AMC 8**, while **Grades 7–8 focus on AMC 10**. The curriculum covers the four core modules of math competitions — Algebra, Geometry, Number Theory, and Counting & Probability — enabling students to achieve one competition milestone each year and **complete AMC 10 preparation before high school, successfully qualifying for AIME**.

2 Expert Coaches. Top Results. Proven Success.

Think Competition courses are taught by **instructors with many years of competition teaching experience**, enabling students to master complex contest concepts efficiently and with ease.

James
Upenn - 5 YOE

Dennis
Duke - 4 YOE

Yichen
Columbia - 4 YOE

3 Collaborate and Excel with Outstanding Peers

Each year, the Competition Track begins with an entrance assessment to ensure students learn alongside peers of similar ability. This structure makes preparation more engaging and collaborative, as students motivate one another and grow together throughout the journey.

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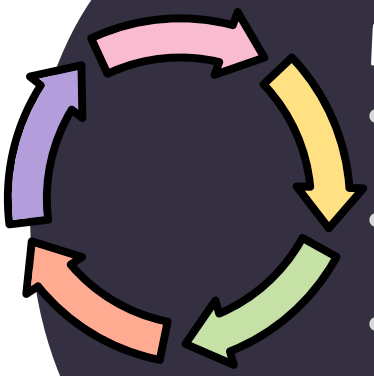
Course Highlights

Clear Structure, Worry-Free for Parents

Personalized Learning Plans with Full Progress Tracking

- **Before Enrollment:** Teachers create **personalized study plans** based on each student' s goals and ability
- **During Learning:** Teachers give **regular feedback and targeted advice**, helping parents track progress
- **Mid-Term & Final Evaluations**: **Parent meetings** and updated study plans ensure steady improvement



Weekly Learning Cycle to Ensure Steady Progress

- **Pre-Class Preparation: 15-minute preview** to review key concepts and prepare for new lessons
- **Homework: Assigned after each class**, with teacher feedback shared with parents
- **Office Hour: Free live sessions** to review and clarify difficult problems
- **Homework Review Videos:** Each homework question includes a **detailed video explanation** for easy review

Year-Round Learning Support

- **Year-round Parent App service** providing fast responses
- Through the Parent App, parents get **direct contact with teachers** for efficient communication and real-time progress updates
- Instant online homework help for **timely learning support**

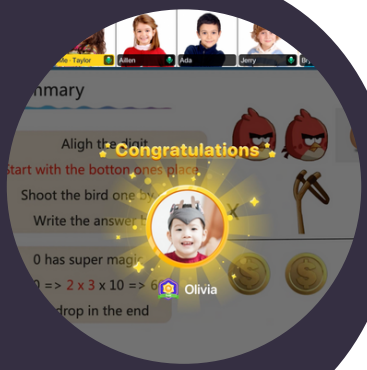
Think Academy US Online

Course Highlights

Happy Learning, Better Results

Thoughtfully Crafted Lessons Inspire a Love for Math

- **Interactive games and scenario-based teaching** make math fun and engaging
- **Gold coin reward system** lets students exchange coins for prizes, motivating them to complete learning tasks actively



Self-Developed Learning App Enhances Every Online Class

- **Think Academy learning app** enhances in-class interaction with hand-raising, polls, and group activities —**keeping students engaged every three minutes**
- Teachers **track progress in real time** for an effective learning experience

A Sense of Achievement Builds Intrinsic Motivation

- Students learn efficiently in class and get **full after-class support** with detailed homework videos and free weekly Office Hours.
- Students **gain higher grades, faster progress**. They are naturally motivated to put more effort in STEM learning and become **confident math learners**

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Basic Math

Number & Operations

Addition and Subtraction of Whole Numbers

1 Calculate by using column addition:

(1) $5638 + 2679 =$ _____ . (2) $2242 + 3391 =$ _____ .

2 Calculate by using column subtraction:

(1) $1305 - 488 =$ _____ . (2) $4312 - 2978 =$ _____ .

3 Calculate by using column subtraction:

(1) $2005 - 399 =$ _____ .

(2) $1128 - 301 =$ _____ .

4 Calculate by using column subtraction:

(1) $4231 - 756 =$ _____ .

(2) $4382 - 2879 =$ _____ .

5 Calculate by using column addition:

(1) $2638 + 1977 =$ _____ .

(2) $3629 + 5878 =$ _____ .

6 Calculate by using column subtraction:

(1) $7031 - 877 =$ _____ .

(2) $6281 - 3879 =$ _____ .

7 Calculate by using column addition:

(1) $1323 + 2003 =$ _____ .

(2) $1998 + 1988 =$ _____ .

8 Calculate by using column addition:

(1) $4736 + 1568 =$ _____ .

(2) $926 + 3982 =$ _____ .

9 Calculate by using column subtraction:

(1) $891 - 299 =$ _____ .

(2) $7321 - 3879 =$ _____ .

Addition and Subtraction of Fractions and Decimals

1 Express 0.25 as a fraction. _____

2 Calculate:

(1) $\frac{2}{13} + \frac{7}{13} =$ _____ .

(2) $\frac{5}{6} + \frac{1}{6} =$ _____ .

(3) $\frac{7}{13} - \frac{4}{13} =$ _____ .

(4) $\frac{14}{19} - \frac{12}{19} =$ _____ .

3 Calculate:

$\frac{1}{10} + \frac{2}{11} =$ _____ ; $\frac{9}{10} - \frac{1}{2} =$ _____ ;

$\frac{1}{8} + \frac{1}{4} =$ _____ ; $\frac{2}{3} - \frac{1}{5} =$ _____ ;

$\frac{3}{4} - \frac{1}{2} =$ _____ ; $\frac{3}{4} - \frac{3}{8} =$ _____ ;

$\frac{1}{2} + \frac{1}{6} =$ _____ ; $\frac{17}{20} - \frac{7}{10} =$ _____ .

4 Calculate:

$\frac{3}{7} + \frac{9}{14} =$ _____ ; $\frac{9}{10} - \frac{1}{2} =$ _____ ;

$\frac{1}{5} + \frac{1}{6} =$ _____ ; $\frac{1}{3} - \frac{1}{4} =$ _____ ;

$\frac{4}{7} - \frac{3}{8} =$ _____ ; $\frac{3}{4} - \frac{3}{7} =$ _____ ;

$\frac{1}{4} + \frac{1}{6} =$ _____ ; $\frac{17}{15} - \frac{7}{20} =$ _____ .

5 Convert the following decimals into fractions.

(1) $0.65 =$ _____

(2) $0.64 =$ _____

(3) $0.28 =$ _____

6 Rewrite the fraction as a mixed number. Rewrite the mixed number as an improper fraction.

(1) $\frac{54}{5} =$ _____ .

(2) $7\frac{3}{7} =$ _____ .

7 Calculate:

(1) $\frac{3}{7} + \frac{7}{3} =$ _____ .

(2) $\frac{9}{2} - \frac{2}{3} =$ _____ .

8 Calculate:

$\frac{3}{7} + \frac{9}{14} =$ _____ ; $\frac{9}{10} - \frac{1}{2} =$ _____ ;

$\frac{1}{5} + \frac{1}{6} =$ _____ ; $\frac{1}{3} - \frac{1}{4} =$ _____ ;

$\frac{4}{7} - \frac{3}{8} =$ _____ ; $\frac{3}{4} - \frac{3}{7} =$ _____ ;

$\frac{1}{4} + \frac{1}{6} =$ _____ ; $\frac{17}{15} - \frac{7}{20} =$ _____ .

9 Use column addition or subtraction to calculate.

(1) $36.54 + 55.19 =$ _____ .

(2) $22.39 - 19.88 =$ _____ .

Addition and Subtraction of Mixed Numbers

1 Calculate:

(1) $2\frac{1}{6} + 1\frac{1}{6} =$ _____

(2) $2\frac{2}{7} + 5\frac{1}{9} =$ _____

(3) $4\frac{1}{8} + 5\frac{7}{8} =$ _____

(4) $1\frac{1}{3} + 3\frac{7}{8} =$ _____

2 Calculate:

(1) $1\frac{1}{7} + 4\frac{2}{7} =$ _____

(2) $4\frac{1}{6} + 1\frac{1}{8} =$ _____

(3) $5\frac{1}{9} + 1\frac{8}{9} =$ _____

(4) $3\frac{3}{5} + 2\frac{2}{3} =$ _____

3 Calculate:

(1) $5\frac{1}{11} + 6\frac{1}{11} =$ _____

(2) $7\frac{1}{3} + 1\frac{1}{4} =$ _____

(3) $3\frac{1}{13} + 4\frac{12}{13} =$ _____

(4) $9\frac{1}{2} + 2\frac{5}{8} =$ _____

4 Calculate:

(1) $4\frac{5}{7} - 2\frac{3}{7} =$ _____

(2) $3\frac{6}{7} - 1\frac{1}{3} =$ _____

(3) $5\frac{1}{9} - 3\frac{4}{9} =$ _____

(4) $6\frac{1}{5} - 1\frac{1}{3} =$ _____

5 Calculate:

(1) $5\frac{5}{9} - 1\frac{4}{9} =$ _____

(2) $6\frac{7}{8} - 2\frac{1}{4} =$ _____

(3) $3\frac{1}{7} - 1\frac{4}{7} =$ _____

(4) $8\frac{1}{7} - 2\frac{1}{3} =$ _____

6 Calculate:

(1) $2\frac{3}{7} - 1\frac{1}{7} =$ _____

(2) $3\frac{7}{8} - 1\frac{9}{10} =$ _____

(3) $4\frac{1}{11} - 2\frac{5}{11} =$ _____

(4) $5\frac{1}{9} - 3\frac{1}{2} =$ _____

7 Calculate:

(1) $3\frac{5}{8} - 1\frac{1}{8} =$ _____

(2) $7\frac{7}{8} - 2\frac{1}{4} =$ _____

(3) $9\frac{1}{6} - 2\frac{5}{6} =$ _____

(4) $4\frac{2}{7} - 2\frac{1}{2} =$ _____

8 $5\frac{1}{3} - 5\frac{2}{7} + 2\frac{2}{3} =$ _____ .

9 Calculate:

(1) $1\frac{1}{13} + 5\frac{1}{13} =$ _____

(2) $3\frac{1}{5} + 1\frac{1}{6} =$ _____

(3) $3\frac{20}{21} + 2\frac{1}{21} =$ _____

(4) $10\frac{7}{8} + 1\frac{1}{2} =$ _____

Multiplication and Division of Fractions

1 Calculate:

(1) $\frac{7}{10} \div 7 =$ _____

(2) $\frac{1}{6} \div 5 =$ _____

(3) $\frac{2}{5} \div 4 =$ _____

(4) $\frac{5}{8} \div 3 =$ _____

(5) $\frac{8}{11} \div 3 =$ _____

(6) $\frac{2}{13} \div 13 =$ _____

2 Change the following mixed numbers to improper fractions.

(1) $1\frac{3}{5} =$ _____ .

(2) $3\frac{1}{3} =$ _____ .

(3) $15\frac{1}{2} =$ _____ .

(4) $5\frac{7}{12} =$ _____ .

(5) $2\frac{5}{8} =$ _____ .

(6) $8\frac{3}{10} =$ _____ .

3 Calculate:

(1) $\frac{4}{9} \times \frac{15}{16} =$ _____ .

(2) $\frac{11}{15} \times \frac{21}{4} =$ _____ .

4 Calculate:

(1) $\frac{7}{9} \div 7 =$ _____

(2) $\frac{1}{8} \div 11 =$ _____

(3) $\frac{7}{13} \div 2 =$ _____

(4) $\frac{1}{15} \div 3 =$ _____

(5) $\frac{5}{16} \div 13 =$ _____

(6) $\frac{5}{6} \div 4 =$ _____

5 (1) $\frac{1}{5} \times \frac{4}{9} =$ _____ ;

(2) $\frac{2}{3} \times \frac{4}{7} =$ _____ ;

(3) $\frac{3}{4} \times \frac{7}{11} =$ _____ ;

(4) $\frac{1}{4} \times \frac{3}{8} =$ _____ .

6 (1) $\frac{1}{5} \times 9 =$ _____ ;

(2) $\frac{3}{11} \times 4 =$ _____ ;

(3) $\frac{5}{6} \times 13 =$ _____ ;

(4) $\frac{2}{21} \times 10 =$ _____ ;

7 (1) $\frac{1}{3} \times 8 =$ _____ ;

(2) $\frac{2}{9} \times 5 =$ _____ ;

(3) $\frac{1}{5} \times 7 =$ _____ ;

(4) $\frac{6}{13} \times 2 =$ _____ ;

(5) $\frac{1}{4} \times 15 =$ _____ ;

(6) $\frac{8}{17} \times 3 =$ _____ .

8 (1) $\frac{1}{7} \times \frac{5}{11} =$ _____ ;

(2) $\frac{1}{5} \times \frac{2}{9} =$ _____ ;

(3) $\frac{4}{5} \times \frac{6}{13} =$ _____ ;

(4) $\frac{1}{3} \times \frac{5}{6} =$ _____ .

9 Calculate:

(1) $2\frac{1}{3} \times \frac{7}{8} =$ _____ .

(2) $3\frac{1}{8} \times \frac{5}{9} =$ _____ .

10 Calculate:

(1) $6\frac{1}{6} \times \frac{5}{7} =$ _____ ;

(2) $4\frac{2}{5} \times \frac{2}{3} =$ _____ .

11 Calculate:

(1) $\frac{24}{35} \times \frac{7}{16} =$ _____ ;

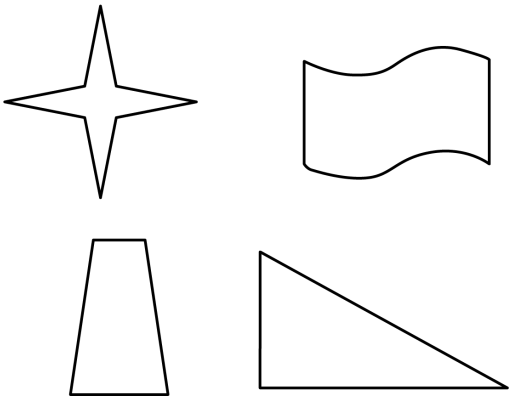
(2) $\frac{63}{20} \times \frac{5}{18} =$ _____ .

NOTE

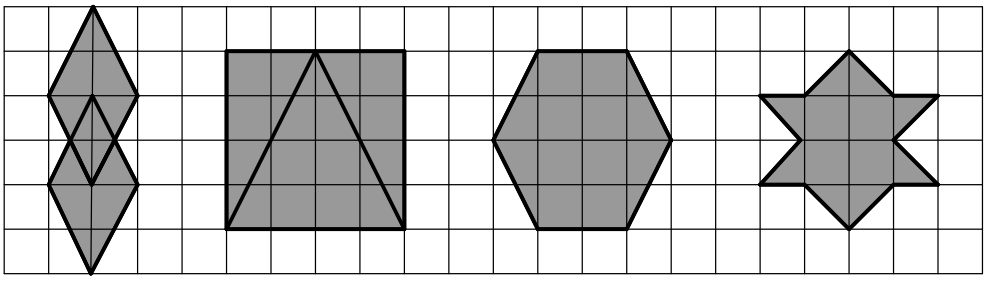
Geometry

Symmetry

1 Draw all lines of symmetry of the figure which is symmetric.



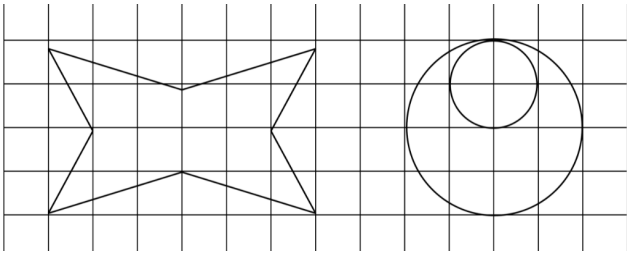
2 How many lines of symmetry does each of the following figures have?



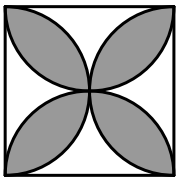
( ) ( ) ( ) ( )

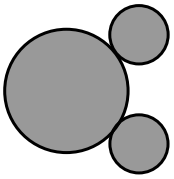
3 Draw all lines of symmetry for each of the figures below.

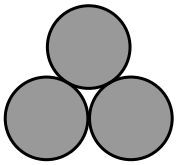
4 Draw all lines of symmetry for each of the following figures.

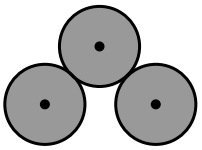


5 Which of the following figures have three lines of symmetry?

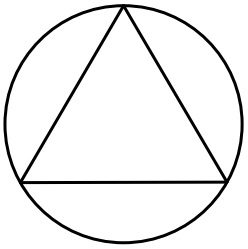
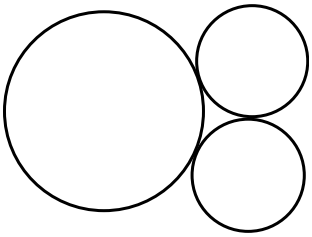
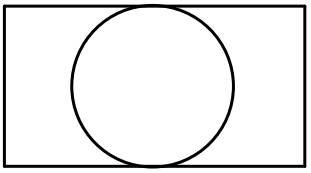
A. 

B. 

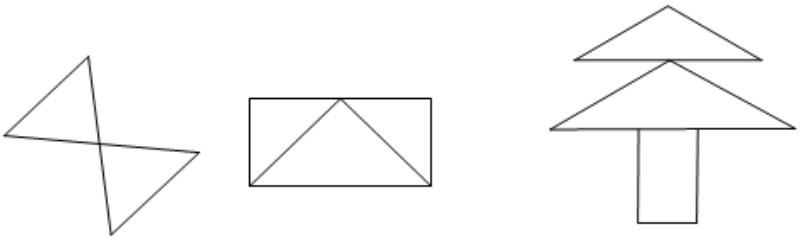
C. 

D. 

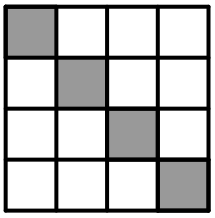
6 How many lines of symmetry does each of the following figures have?

		
_____	_____	_____

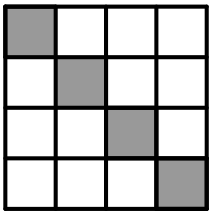
7 Draw all lines of symmetry for each of the following figures.



8 (1) Shade two squares to make the figure symmetric and has only one line of symmetry. (More than one way.)

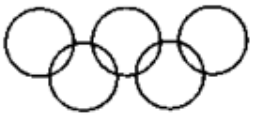


(2) Shade two squares to make the figure symmetric and has only two lines of symmetry. (More than one way.)



9 Draw all lines of symmetry of the figure which is symmetric.

_____



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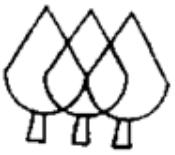
_____



_____

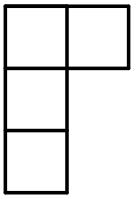
_____

_____

_____

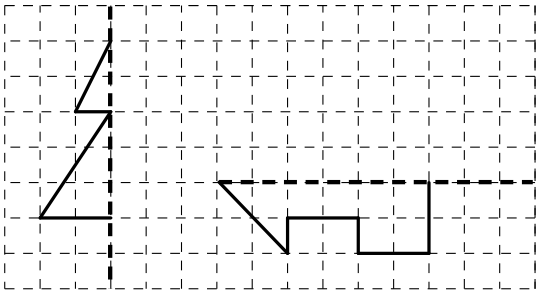
_____

10 Add one more square to make the figure below symmetric. (There is no single answer.)

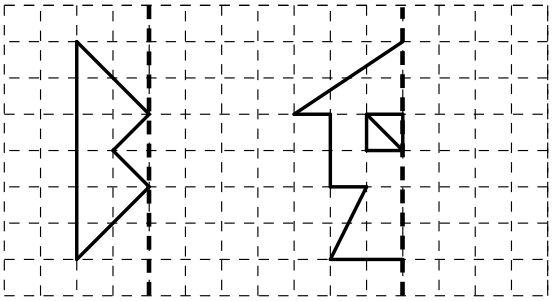


11 Draw the other half of each figure below according to its line of symmetry.

(1) The dotted line is the line of symmetry.

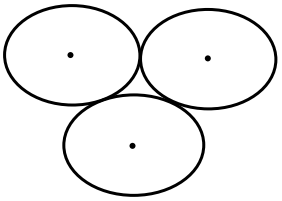


(2) The dotted line is the line of symmetry.

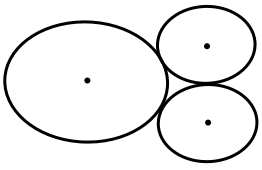


12 Draw all lines of symmetry for each of the following figures.

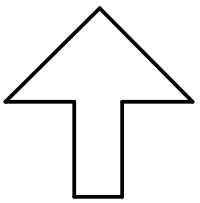
(1)



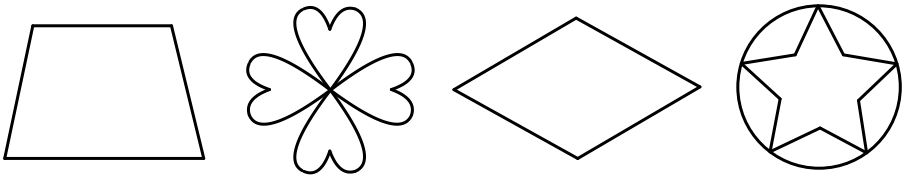
(2)



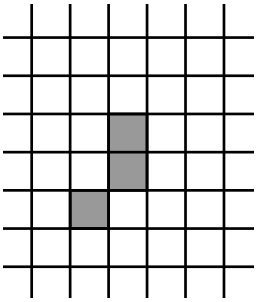
13 Draw all lines of symmetry of the following figure.



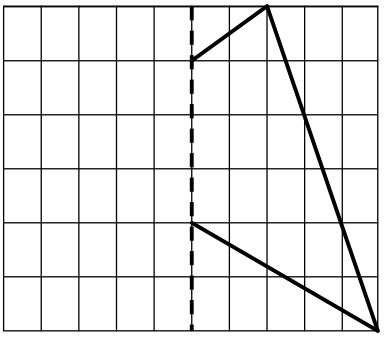
14 Draw all lines of symmetry for each of the following figures.



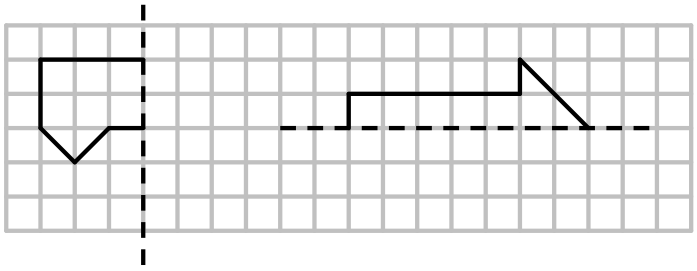
15 Shade a square to make the figure below symmetric. (There is no single answer)



16 Draw the other half of each figure below according to its line of symmetry. The dotted line is the line of symmetry.

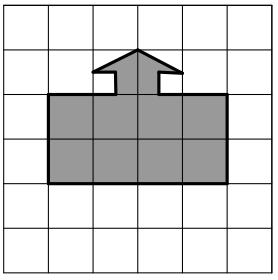


17 Draw the other half of each figure below according to its line of symmetry.The dotted line is the line of symmetry.

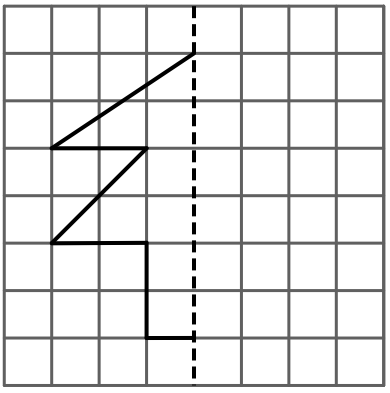


18 Answer the following questions.

(1) Draw all lines of symmetry of the following figure.

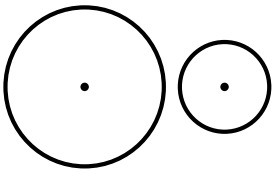


(2) Draw the other half of the figure below according to its line of symmetry. The dotted line is the line of symmetry.

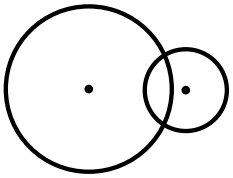


19 Draw all lines of symmetry for each of the following figures.

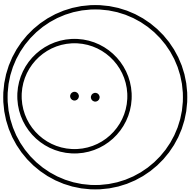
(1)



(2)



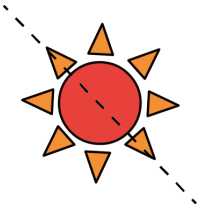
(3)



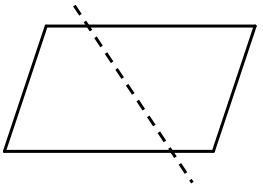
20 Which of the dotted lines is the line of symmetry for the figure?

A.

B.

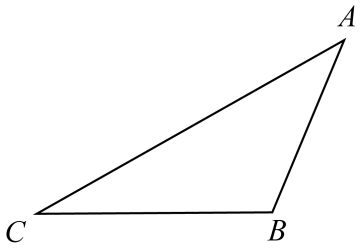


C.

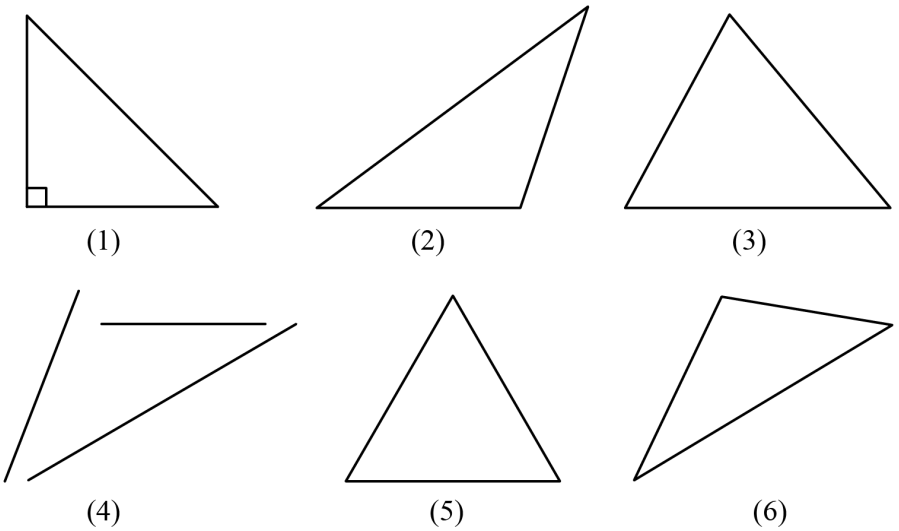


Knowing Triangles

1 In isosceles triangle ABC, $BA = BC$, and $\angle C = 31^\circ$, so $\angle B =$ _____ $^\circ$.

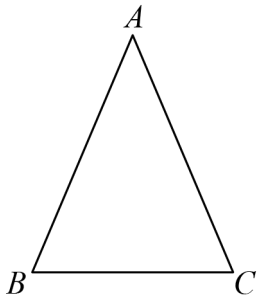


2 Classify the following triangles.

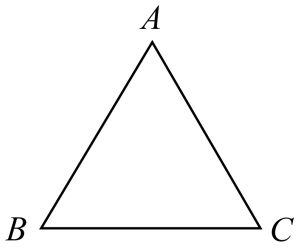


Acute triangles	
Right triangles	
Obtuse triangles	

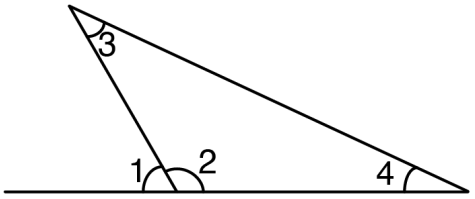
3 In isosceles triangle ABC, $AB = AC$, and $\angle C = 67^\circ$, so $\angle A =$ _____ $^\circ$.



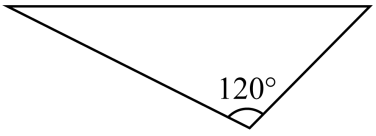
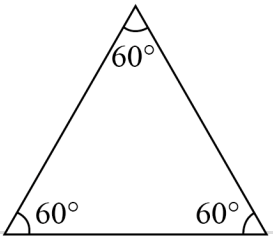
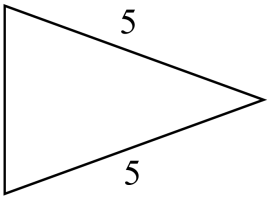
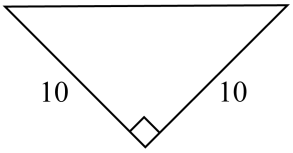
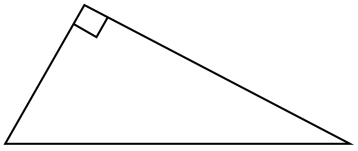
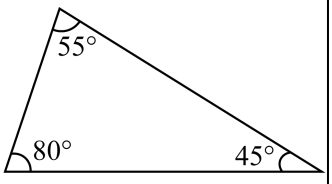
4 In triangle ABC, $AB = AC = 2$ cm, and $\angle B = 60^\circ$, so $BC =$ _____ cm.



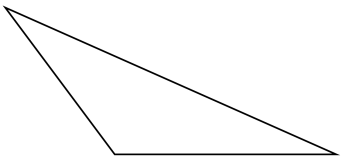
5 As shown in the figure below, $\angle 2 = 2\angle 1$, and $\angle 3 = 35^\circ$. Find the measure of $\angle 2$ and $\angle 4$, respectively.



6 Identify the type of each triangle and fill in the blanks. (Choose one from acute / obtuse / right / isosceles / isosceles right / equilateral)

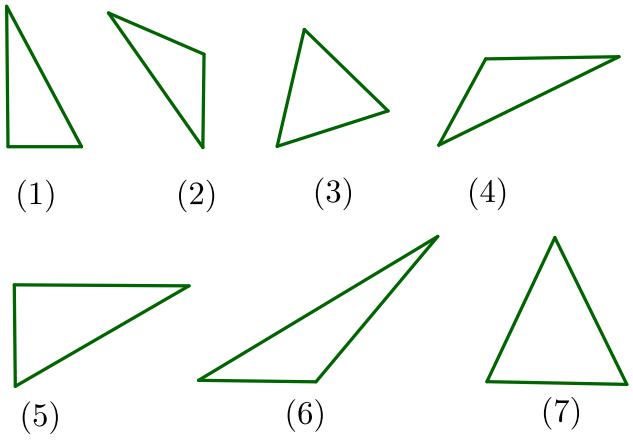
		
_____ triangle	_____ triangle	_____ triangle
		
_____ triangle	_____ triangle	_____ triangle

7 Classify the triangle.



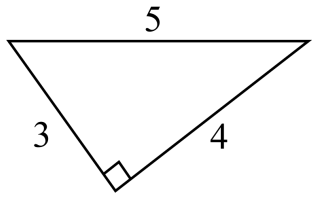
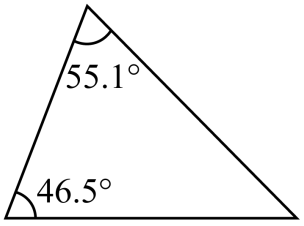
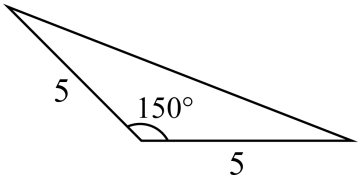
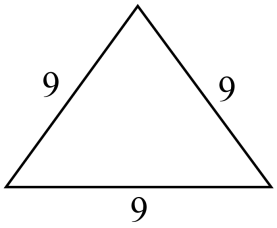
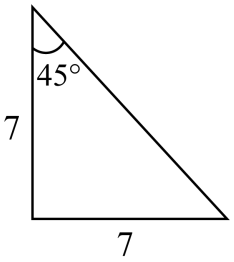
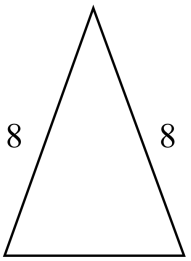
A. Right triangle B. Acute triangle C. Obtuse triangle

8 Classify the following triangles.

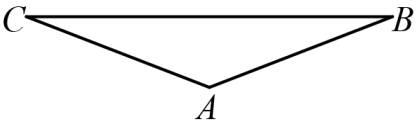


Acute triangles	
Right triangles	
Obtuse triangles	

9 Identify the type of each triangle and fill in the blanks. (Choose one from acute / obtuse / right / isosceles / isosceles right / equilateral)

		
_____ triangle	_____ triangle	_____ triangle
		
_____ triangle	_____ triangle	_____ triangle

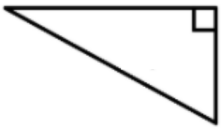
10 In isosceles triangle ABC, $AC = AB$, and $\angle C = 21^\circ$, so $\angle A =$ _____ $^\circ$.



11 If one angle of a triangle is an acute angle, classify the type of this triangle.

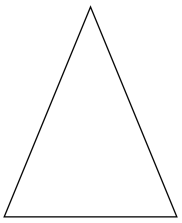
A. Acute triangle
B. Obtuse triangle
C. Right triangle
D. Cannot be determined.

12 Classify the triangle.



A. Acute triangle B. Right triangle C. Obtuse triangle

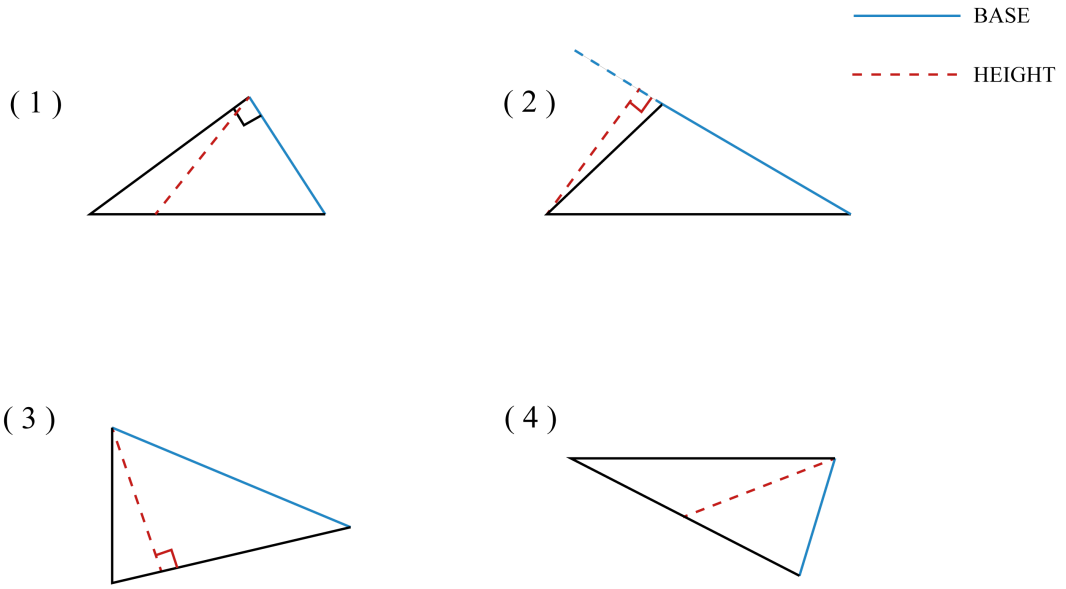
13 Classify the triangle.



A. Acute triangle B. Right triangle C. Obtuse triangle

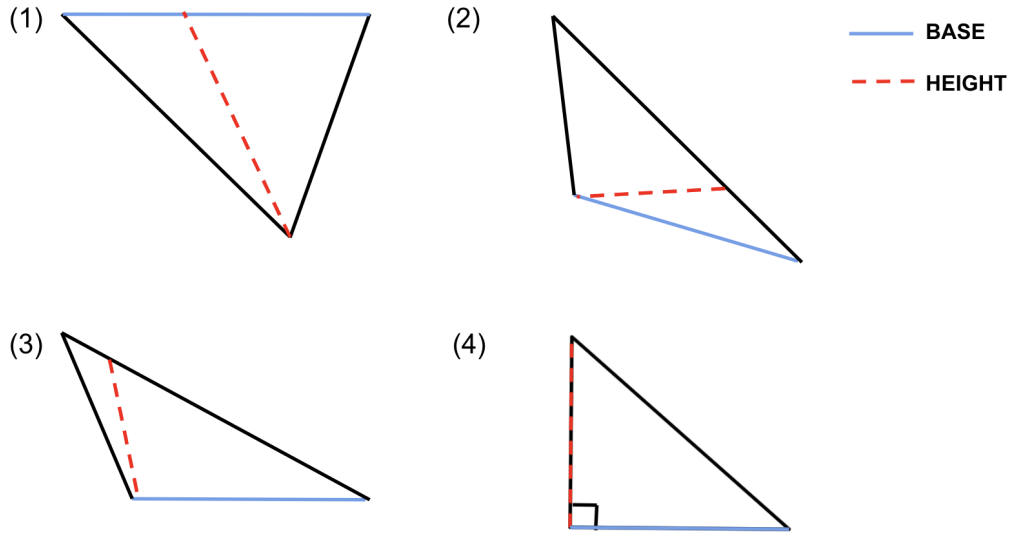
Area of Triangles

1 Which of the following shows the correct way to draw the height of the triangle?



A. (1) B. (2) C. (3) D. (4)

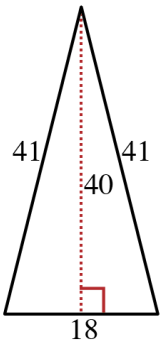
2 Which of the following shows the correct way to draw the height of the triangle?



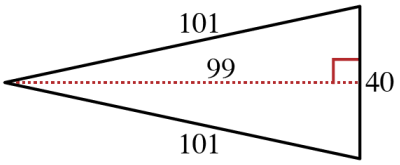
A. (1) B. (2) C. (3) D. (4)

3 Find the area of the following triangles.

(1)

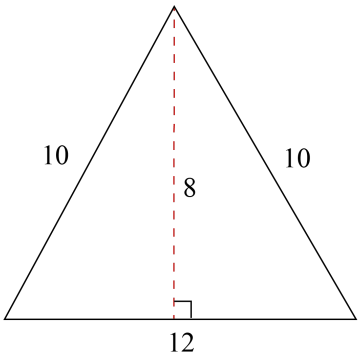


(2)

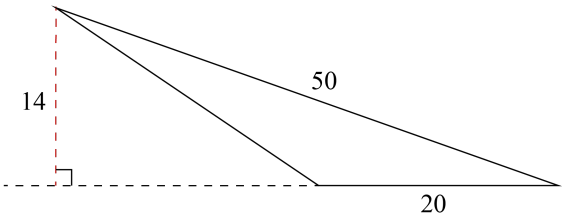


4 Find the area of the following triangles:

(1)

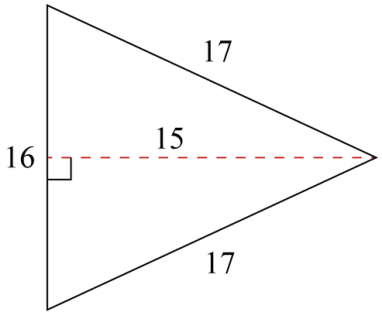


(2)

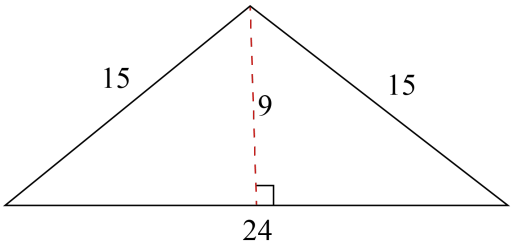


5 Find the area of the following triangles:

(1)

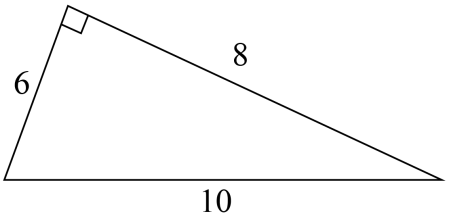


(2)

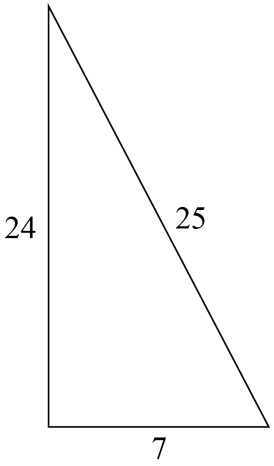


6 Find the area of the following triangles:

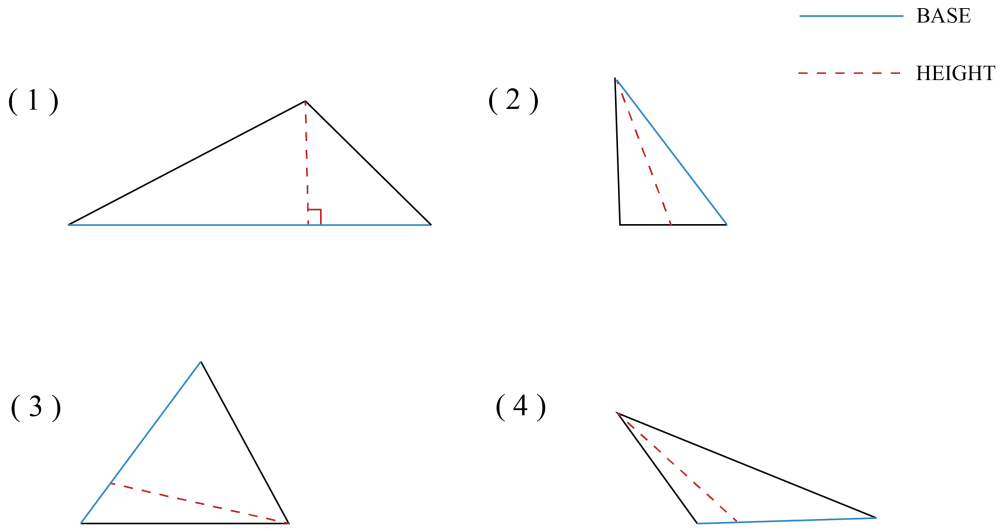
(1)



(2)



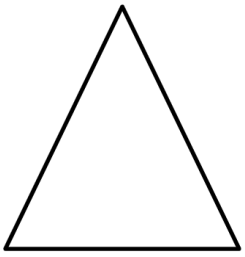
7 Which of the following shows the correct way to draw the height of the triangle?



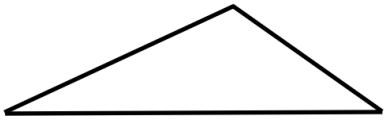
A. (1) B. (2) C. (3) D. (4)

8 Draw the three heights of the following triangles.

(1)

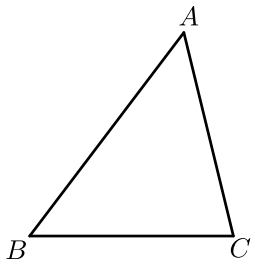


(2)

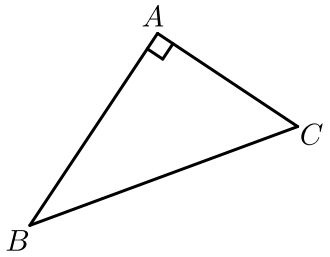


9 Draw the three heights of following triangles.

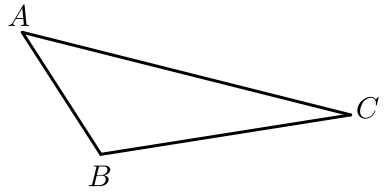
(1)



(2)

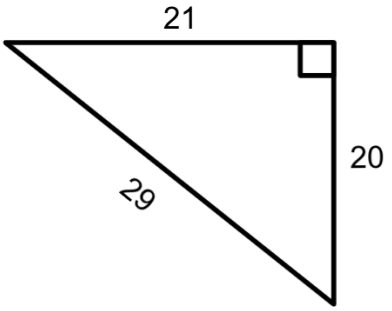


(3)

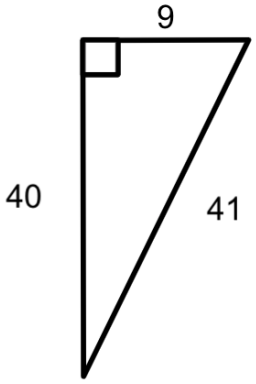


10 Find the area of each triangle:

(1)

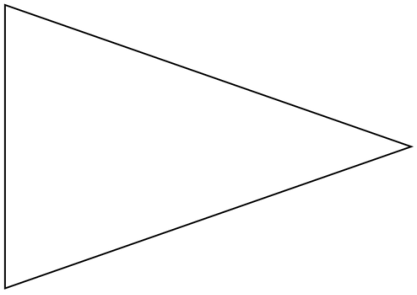


(2)

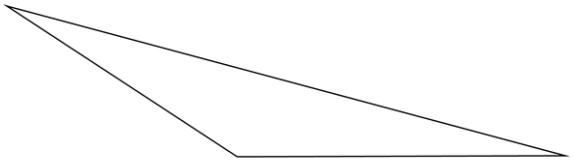


11 Draw the three heights of the following triangles.

(1)

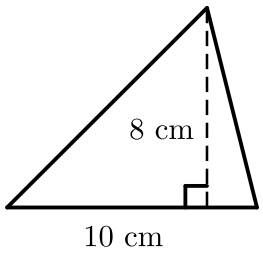


(2)

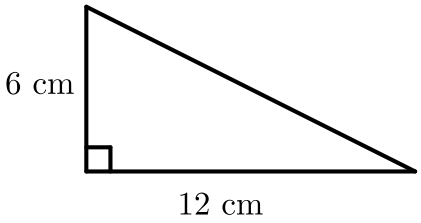


12 Calculate the area of each triangle.

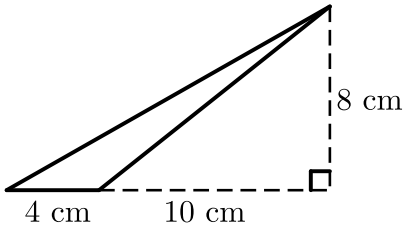
(1)



(2)

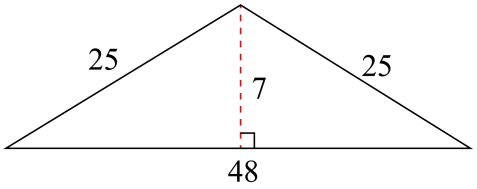


(3)

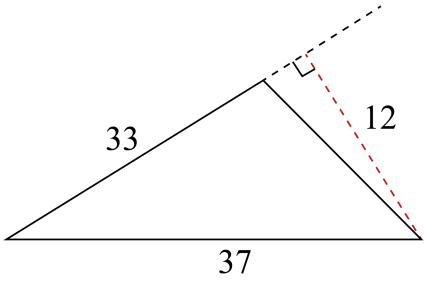


13 Find the area of the following triangles.

(1)

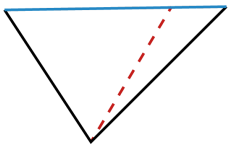


(2)

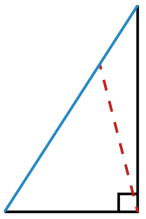


14 Which of the following shows the correct way to draw the height of the triangle?

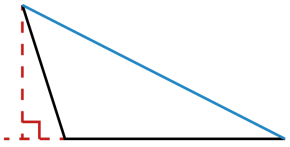
(1)



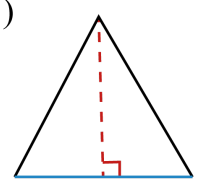
(2)



(3)



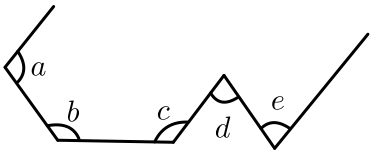
(4)



A. (1) B. (2) C. (3) D. (4)

Knowing Angles

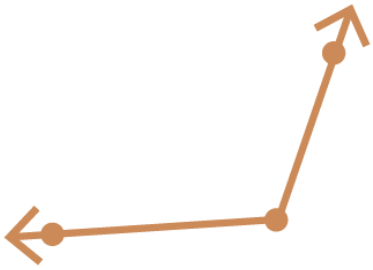
1 A wire is bent to form the figure below. Which angles are larger than a right angle?



A. $\angle d$ and $\angle e$
B. $\angle a$, $\angle b$ and $\angle c$
C. $\angle a$, $\angle c$, $\angle d$ and $\angle e$
D. $\angle a$, $\angle b$, $\angle c$, $\angle d$ and $\angle e$

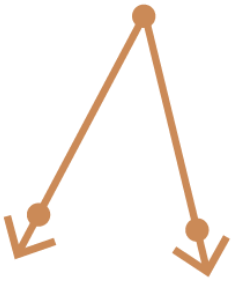
2 Find the angle measure of each angle and decide whether each is an acute angle, a right angle or an obtuse angle.

(1)



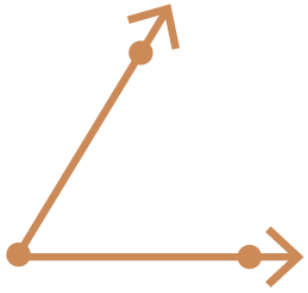
Angle measure: _____ °
Type of angle: _____ angle

(2)



Angle measure: _____ °
Type of angle: _____ angle

(3)

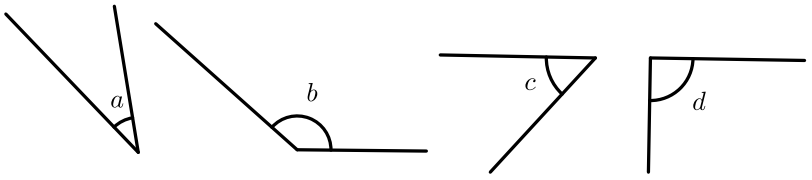


Angle measure: _____ °
Type of angle: _____ angle

(4)

Angle measure: _____ °
Type of angle: _____ angle

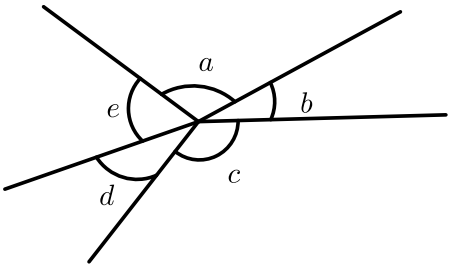
3 Which of these angles are smaller than a right angle?



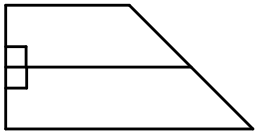
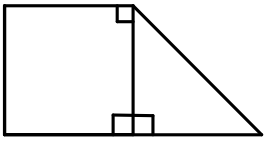
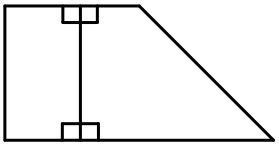
A. $\angle a$ and $\angle b$ B. $\angle a$ and $\angle c$ C. $\angle b$ and $\angle c$ D. $\angle b$ and $\angle d$

4 In the figure, name the two angles that are greater than 90°.

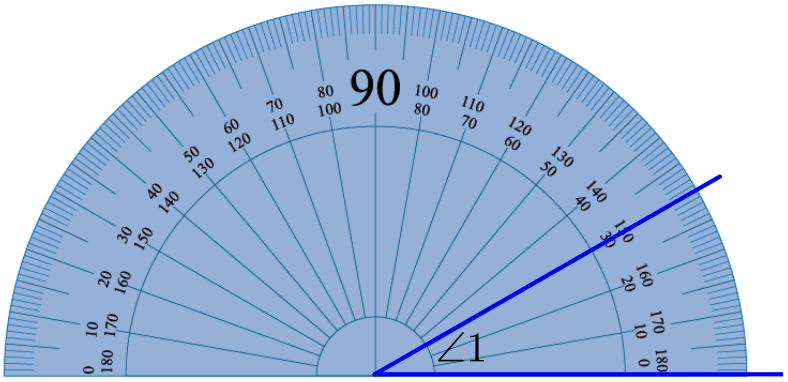
Angles: ∠ _____ and ∠ _____ .



5 How many right angles are there in each of the following graphs?

		
_____ ;	_____ ;	_____ .

6 Lily has drawn an angle with the protractor, denoted by $\angle 1$ (as shown below).



(1) $\angle 1 =$ _____ $^\circ$, it is a/an _____ angle.(Right angle/ Acute angle/ Obtuse angle/ Straight angle)

(2) Draw an angle which is 40° larger than a right angle on the protractor and mark it with $\angle 2$.

7 Classify the following angles.

① ② ③ ④ ⑤ ⑥

Acute angle: _____

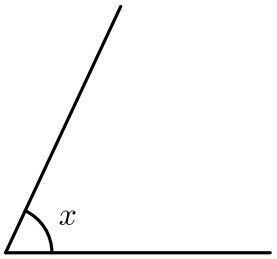
Right angle: _____

Obtuse angle: _____

8 When it is 9 o' clock, the hour and minute hands of the clock make a/an ( ) .

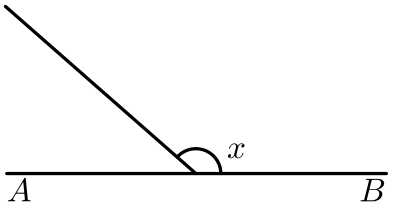
A. Acute Angle
B. Right Angle
C. Obtuse Angle
D. Straight Angle

9 Which of the following is the best estimate for $\angle x$?



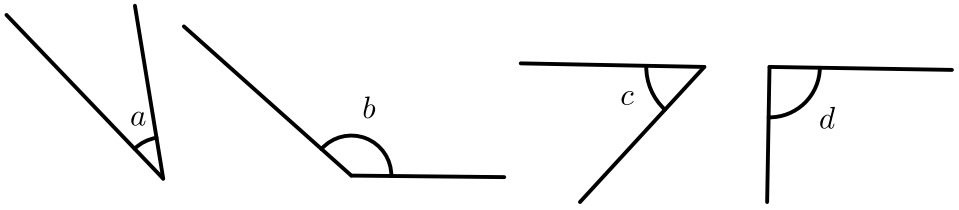
A. 10°
B. 70°
C. 90°
D. 120°

10 In the figure below, AB is a straight line. Which one of the following is the best estimate of $\angle x$?



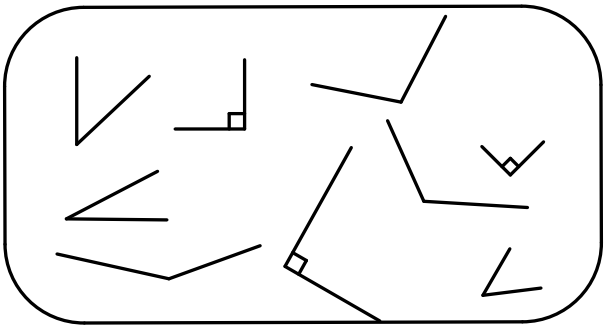
A. 35° B. 79° C. 155° D. 180°

11 Which of these angles is/are larger than a right angle?



A. $\angle a$ B. $\angle a$ and $\angle c$ C. $\angle b$ D. $\angle b$ and $\angle d$

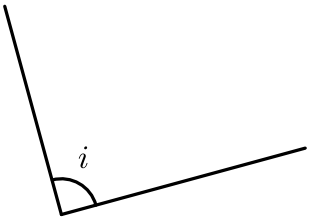
12 There are 3 acute angles in the figure below.



A. True B. False

13 Estimate and then use a protractor to measure the following angles.

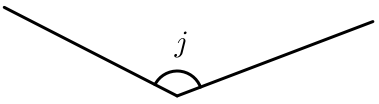
(1)



Estimate: $\angle i =$ _____

Actual: $\angle i =$ _____

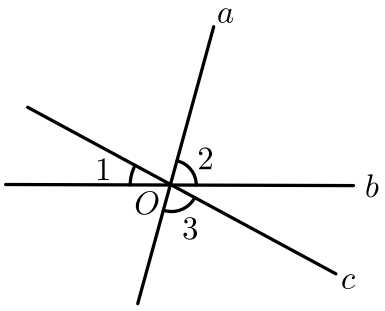
(2)



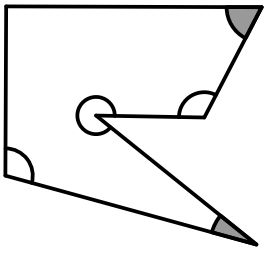
Estimate: $\angle j =$ _____

Actual : $\angle j =$ _____

14 In the figure below, lines a, b, and c intersect at point O. Given that $\angle 1 = 29^\circ$ and $\angle 2 = 76^\circ$, what is the measure of $\angle 3$?



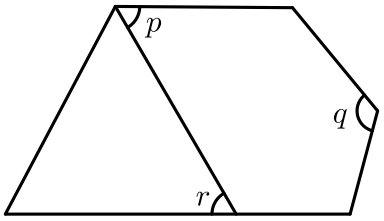
15 Observe the figure below carefully.



(1) How many sides does the figure have? _____

(2) How many of the marked angles are acute angles? _____

16 Estimate and then use a protractor to measure the following angles.



Estimate: $\angle p =$ _____

Actual: $\angle p =$ _____

Estimate: $\angle q =$ _____

Actual: $\angle q =$ _____

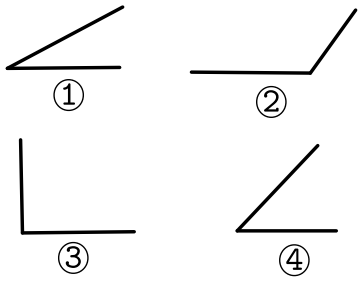
Estimate: $\angle r =$ _____

Actual: $\angle r =$ _____

17 Observe the angles formed by the hour hands and minute hands of the clocks below. What are the types of each angle, respectively?(Right angle/ Acute angle/ Obtuse angle)

_____ angle	_____ angle	_____ angle	_____ angle

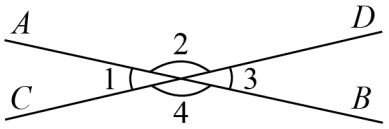
18 Arrange the measurements of angles below in order from largest to smallest. (Fill the numbers in the blanks)



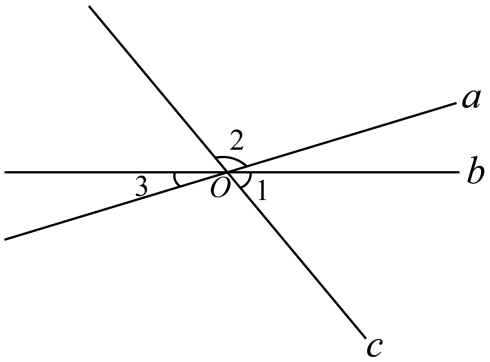
_____ > _____ > _____ > _____

Vertical Angles

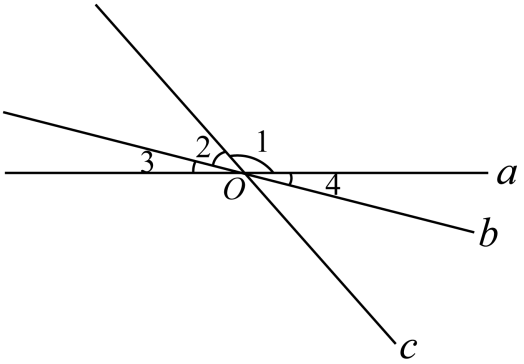
1 As shown in the figure below, line AB and line CD intersect and form four angles. The vertical angle of $\angle 1$ is $\angle$ _____ . If $\angle 1 = 25^\circ$, then $\angle 2 =$ _____ $^\circ$, $\angle 3 =$ _____ $^\circ$, $\angle 4 =$ _____ $^\circ$.



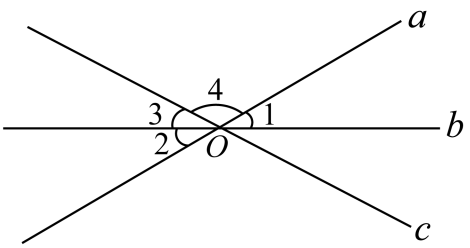
2 As shown in the figure below, line a, b, and c intersect at point O. Given that $\angle 1 = 40^\circ$ and $\angle 3 = 15^\circ$, find the measure of $\angle 2$.



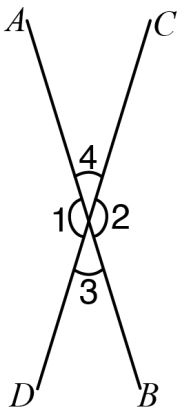
3 As shown in the figure below, line a, b, and c intersect at point O. Given that $\angle 2 = 2\angle 3$ and $\angle 1 = 120^\circ$, find the measure of $\angle 4$.



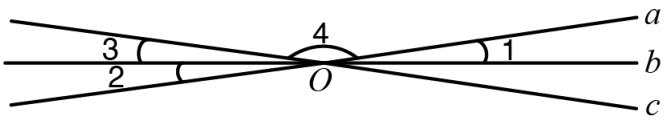
4 As shown in the figure below, line a, b, and c intersect at point O. Given that $\angle 2 = \angle 3$, and $\angle 4 = 150^\circ$, find the measure of $\angle 1$.



5 As shown in the figure below, line AB and line CD intersect and form four angles. The vertical angle of $\angle 3$ is $\angle$ _____ . If $\angle 3 = 34^\circ$, then $\angle 1 =$ _____ $^\circ$, $\angle 2 =$ _____ $^\circ$, $\angle 4 =$ _____ $^\circ$.

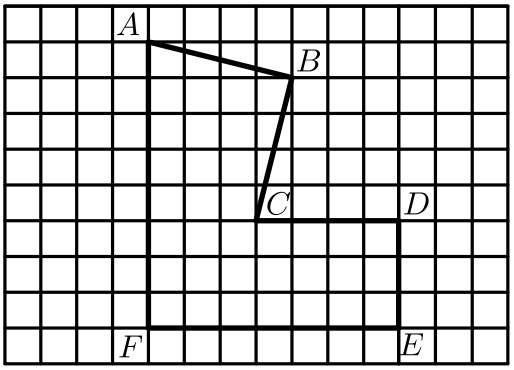


6 As shown in the figure below, line a, b, and c intersect at point O. Given that $\angle 2 = \angle 3$, and $\angle 4 = 164^\circ$, find the measure of $\angle 1$.



Parallel and Perpendicular

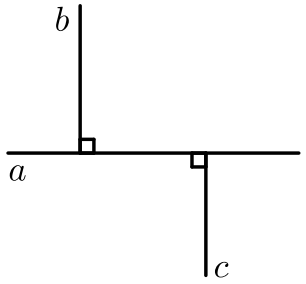
1 Observe the figure below.



(1) Name a pair of parallel lines. _____ and _____

(2) Name a pair of perpendicular lines.

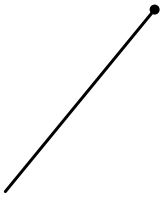
2 Both line b and line c _____ (parallel/perpendicular) to line a, so we can say line b is _____ (parallel/perpendicular) with line c.



3 Complete the following requirements.

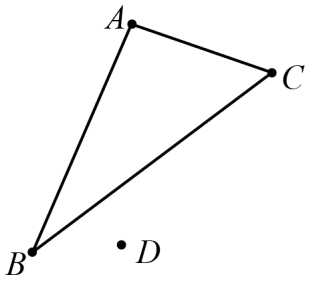
(1) Draw an angle use the point below as the vertex, and mark the names of all the parts of the angle.

(2) Use the side below to draw an angle.

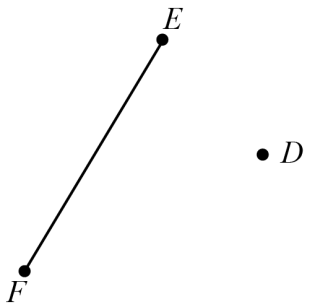


4 Answer the following questions.

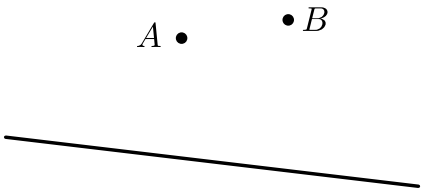
(1) Draw a line perpendicular to $\overline{AC}$ through point D.



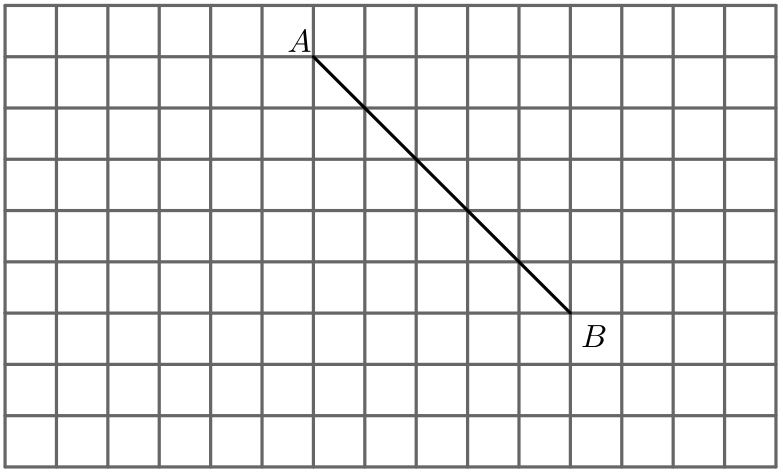
(2) Draw a line segment parallel to $\overline{EF}$ through point D.



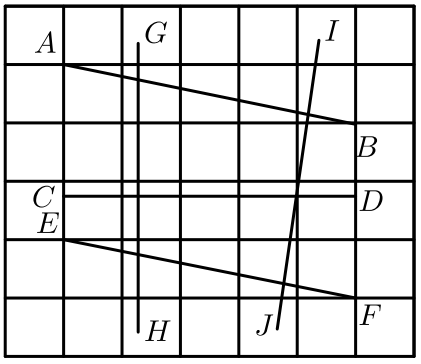
5 Draw a line through point A parallel to the line below, then draw a line through point B perpendicular to the line below.



6 Complete the following requirements.
In the diagram below, AB is a line segment.
Draw line CD perpendicular to AB.
Draw line EF perpendicular to CD.
Draw line GH perpendicular to EF.



7 Observe the figure below.



(1) Name a line parallel to AB. _____

(2) Name a line perpendicular to CD. _____

NOTE

Word Problem

Word Problem of Fractions

1. There are 36 cookies. Lily eats $\frac{1}{12}$ of all cookies. Lucy eats $\frac{1}{9}$ of all cookies. How many cookies do they eat in total?

2. Andy and her friend April shared a bag of chips. Andy ate $\frac{1}{5}$ of the whole chips and April ate $\frac{1}{4}$ of the whole chips. What fraction of the chips did they eat in total? What fraction of the chips was left over?

3 Penny and Sara bought a cake. Penny ate $\frac{2}{9}$ of the whole cake, and Sara ate $\frac{1}{5}$ of the whole cake. What fraction of the cake did they eat in total? What fraction of the cake was left over?

4 Jane has a roll of red wire of 5 m long and a roll of blue wire of $\frac{17}{7}$ m long. She uses $\frac{13}{7}$ m of the red wire. Which roll of wire left is longer? How long are the two rolls of wire left in total?

5 Dani and Judy bought a bottle of coke. Dani drank $\frac{1}{6}$ of the whole bottle, and Judy drank $\frac{5}{13}$ of the whole bottle. What fraction of the whole bottle of coke did they drink in total? What fraction of the whole bottle of coke was left over?

6 There are 30 boys in the class, taking up $\frac{1}{3}$ of all students in the class. There are _____ students in this class.

7 Zaza and Judy bought a bottle of coke. Zaza drank $\frac{4}{9}$ of the whole bottle, and Judy drank $\frac{2}{7}$ of the whole bottle. What fraction of the whole bottle of coke did they drink in total? What fraction of the whole bottle of coke was left over?

8 There are 64 cookies. Albert eats $\frac{1}{4}$ of all cookies. Ken eats $\frac{3}{8}$ of all cookies. How many cookies do they eat in total?

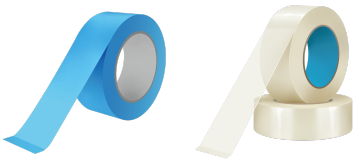
9 There are 35 girls in the class, taking up $\frac{5}{8}$ of all students in the class. There are _____ students in this class.

10 Bob and his friend Amy shared a bag of chips. Bob ate $\frac{2}{15}$ of the whole chips and Amy ate $\frac{1}{6}$ of the whole chips. What fraction of the chips did they eat in total? What fraction of the chips was left over?

11 Jodie and her friend April shared a bag of chips. Jodie ate $\frac{3}{14}$ of the whole chips and April ate $\frac{5}{8}$ of the whole chips. What fraction of the chips did they eat in total? What fraction of the chips was left over?

12 There are 60 cakes. Peter eats $\frac{1}{3}$ of all cakes. Ken eats $\frac{3}{10}$ of all cakes. How many cakes do they eat in total?

13 Jane has a roll of duct tape of 2 m long and a roll of transparent tape of $\frac{7}{8}$ m long. She uses $\frac{3}{8}$ m of the duct tape. Which roll of tape left is longer? How long are the two rolls of tape left in total?



14 There are 48 cookies. Irene eats $\frac{1}{6}$ of all cookies. Lisa eats $\frac{1}{4}$ of all cookies. How many cookies do they eat in total?

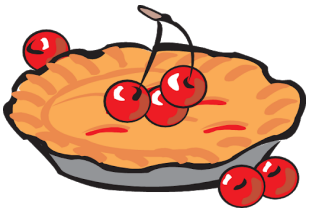
15 The farm grows carrots, cabbage, and potatoes. The amount of carrots is $\frac{5}{12}$ of the whole crops. The amount of cabbage is $\frac{1}{4}$ of the whole crops. What fraction of all crops do carrots and cabbage take up? What fraction of all crops do potatoes take up?

16 There are 500 students in the school, and $\frac{14}{25}$ are girls. There are _____ girls in this school.

17 Sam and Sara bought a cake. Sam ate $\frac{2}{7}$ of the whole cake, and Sara ate $\frac{1}{4}$ of the whole cake. What fraction of the cake did they eat in total? What fraction of the cake was left over?

Word Problem of Decimals

1 Bob bought a big pie. He ate 0.3 kg of the pie first, and then ate 0.15 kg. His sister Ellie ate $\frac{4}{10}$ kg of the pie. Who ate more?

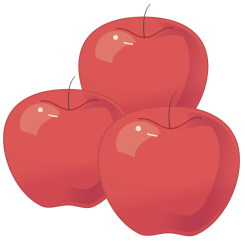


2 There is a basket with 8.96 kg of peaches at the beginning. Then, 1.23 kg of peaches are added into the basket. At last, 3.68 kg of peaches are added into the basket. How many kilograms of peaches are there in the basket now?

3 Linda has 12.25 kg of apples. She gives 2.5 kg to Amy and 4.15 kg to Ben.

(1) How many kilograms of apples does Linda give to Amy and Ben in total?

(2) How many kilograms of apples are left?



4 There is a water tank with 1.66 L of water at the beginning. Then, 15.72 L of water is poured into the water tank. At last, 6.57 L of water is poured into the water tank. How much water is in the water tank now?

5 There is a basket with 8.4 kg of oranges at the beginning. Then, 7.12 kg of oranges are added into the basket. At last, 3.78 kg of oranges are added into the basket. How many kilograms of oranges are there in the basket now?

6 Tom has 15.15 kg of bananas. He gives 5.25 kg to James and 3.05 kg to Sam.

(1) How many kilograms of bananas does Tom give to James and Sam in total?

(2) How many kilograms of bananas are left?

7 There is a bottle with 2.3 L of water at the beginning. Then, 11.25 L of water is poured into the bottle. At last, 7.61 L of water is poured into the bottle. How much water is in the bottle now?

8 Lisa has 14 kg of apples. She gives 3.5 kg to Amy and 2.15 kg to Ben. How many kilograms of apples are left?

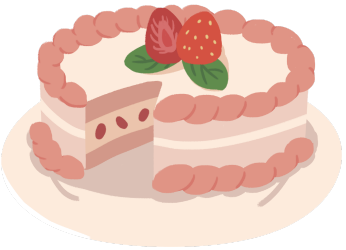
9 There is a basket with 3.25 kg of peaches at the beginning. Then, 5.1 kg of peaches are added into the basket. At last, 7.5 kg of peaches are added into the basket. How many kilograms of peaches are there in the basket now?

10 Laura has 10.75 kg of oranges. She gives 1.5 kg to her sister and 4.35 kg to her brother.

(1) How many kilograms of oranges does Laura give to her sister and brother in total?

(2) How many kilograms of oranges are left?

11 James bought a big cake. He ate 0.19 kg of the cake first, and then ate 0.23 kg. His brother David ate $\frac{2}{5}$ kg of the cake. Who ate more?



12 There is a warehouse with 8.36 tons of vegetables at the beginning. Then, 5.69 tons of vegetables are added into the warehouse. At last, 1.26 tons of vegetables are added into the warehouse. How many tons of vegetables are in the warehouse now?

13 Nini has 28 kg of peaches. She gives 14.52 kg to Irene and 10.23 kg to Bob. How many kilograms of peaches are left?

14 There are 150 boys in the school, taking up $\frac{2}{5}$ of all students in the school. There are _____ students in this school.

NOTE

NOTE

Advanced Math

Number & Operations

Calculating Fractions, Decimals, and Percentages

1 Fill in the blanks in the table below.

Fraction	Decimal	Percentage
$\frac{5}{8}$	_____	_____
_____	0.875	_____
_____	_____	25%
_____	3.75	_____
$\frac{3}{8}$	_____	_____

2 Fill in the blanks in the table below.

Fraction	Decimal	Percentage
$\frac{1}{8}$	_____	_____
$\frac{3}{8}$	_____	_____
$\frac{5}{8}$	_____	_____
$\frac{7}{8}$	_____	_____
$1\frac{1}{8}$	_____	_____

3 Fill in the blanks in the table below.

Fraction	Decimal	Percentage
$\frac{1}{5}$	_____	_____
_____	3.6	_____
_____	_____	37.5%
_____	1.15	_____
$\frac{17}{10}$	_____	_____

4 Calculate:

(1) $1.5 + 0.7 \times \frac{5}{9} - \frac{2}{9}$

(2) $\frac{3}{8} - \left(0.25 + \frac{3}{4}\right) \times 0.35$

5 Calculate:

$$\frac{2}{15} \div \left(2.1 - 1\frac{3}{4}\right) + \frac{2}{7} \times \frac{3}{4}$$

6 $1.2 \times \left[7 - 4 \div \left(\frac{2}{15} + \frac{2}{3}\right) + 2 \div 1\frac{1}{2}\right] =$ _____ .

7 Calculate: $2 \div \left(80\% \times 11\frac{1}{4} - 1.25 \times \frac{4}{5}\right) \times \left(7\frac{1}{4} + \frac{1}{8} + 0.625\right)$

8 Calculate:

(1) $3.6 \times \frac{4}{5} + 6.4 \times \frac{4}{5}$

(2) $\frac{3}{7} - \frac{8}{15} \times \frac{3}{7}$

(3) $\frac{5}{12} \times \frac{4}{9} + \frac{7}{12} \div \frac{9}{4}$

9 $99 \times \frac{5}{8} - 0.625 \times 68 + 6.25 \times 0.1 =$ _____ .

10 $\dfrac{2}{1 - \frac{3}{4}} =$ _____

11 Calculate: $\frac{5}{6} - \left(0.75 + \frac{1}{4}\right) \times 75\%$

12 $3 + \cfrac{1}{7 + \cfrac{1}{16}} =$ _____

13 $4+\cfrac{1}{3+\cfrac{1}{2+\cfrac{1}{2}}}=$ _____

A. $4\frac{1}{2}$ B. $\frac{20}{17}$ C. $4\frac{5}{17}$

14 Calculate:

(1) $\left(\frac{1}{2}+80\%\times 50\%\right)\div\frac{3}{5}+\frac{2}{5}$

(2) $2.4+\frac{3}{5}\times 3+5.6$

15 Calculate:

(1) $11\frac{2}{3} \times 80\% \div \left(2\frac{1}{9} + 8\frac{1}{3} \div 2.5\right)$

(2) $7\frac{1}{3} - \left(2.4 + 1\frac{2}{3} \times 4\right) \div 170\%$

(3) $\frac{1}{2} \times 60\% + \frac{1}{3} \times 50\% + \frac{1}{4} \times 0.4$

16 Calculate:

(1) $80\% \times \left(1\frac{2}{3} + 2.5\right) - 65\% \div 2\frac{1}{6} =$ _____ .

(2) $(39 - 12.5\% \times 8) \div \left(1\frac{3}{8} - \frac{7}{12}\right) - 24 \div 3 \times \frac{1}{3} =$ _____ .

17 Calculate: $\left(\frac{1}{4} - 10\% \div 2\right) \times \frac{5}{13} + 1 \div 1\frac{1}{12} =$

18 Calculate: $0.75 \times 65 + \frac{3}{4} \times 36 - 75\%$

19 Calculate: $2.4 + \frac{3}{8} \times 2 - \frac{1}{4}$

20 Calculate: $3.27 \times \frac{3}{7} + 3.73 \div 2\frac{1}{3}$

21 Calculate: $\left(\frac{1}{2} + 80\% \times 50\%\right) \div \frac{3}{5} + \frac{2}{5} =$

22 Calculate: $24 \times \left(\frac{4}{3} - 37.5\% + 1.75 - \frac{13}{12}\right)$

23 Calculate: $\left[30 - 2 \div \left(0.5 - \frac{1}{3}\right) \times 1\frac{2}{3}\right] \div \left(1\frac{3}{10} \div 0.13\right)$

Calculation Strategies on Fractions, Decimals, and Percentages

1 Calculate:

$$4.36 + 5\frac{8}{11} + 5.64 + 1\frac{3}{11} + 20\% = _____ .$$

2 Calculate:

$$\frac{4}{7} \times 15 + 0.625 \times 7 + 15 \times \frac{3}{7} + 9 \times 62.5\%$$

3 Calculate:

(1) $28\% + \frac{5}{12} + 72\% + 3.7 + \frac{7}{12} - 0.7$

(2) $4\frac{7}{9} + 23.6 + 27\% + \frac{2}{9} - 1.6 + 73\%$

(3) $35\frac{3}{7} - 23.75 + 3\frac{4}{7} + 34.75 + 40\%$

4 Calculate:

$75 \times 3.2 \times 0.01 + \frac{3}{4} \times 67 - 0.75 \times 2.2 =$ _____ .

$\frac{7}{8} \times 43 + 0.875 \times 22 - 8.75 \times 0.1 =$ _____ .

$62.5\% \times 37 + \frac{5}{8} - 0.625 \times 30 =$ _____ .

5 Calculate:

$3.9 \times \frac{3}{8} + 4.1 \times \frac{3}{8}$

$0.25 \times 7 + 11 \times \frac{1}{4} + 2 \times 25\%$

6 Calculate:

$3\frac{4}{13} + 30\% + 2.53 + 4\frac{9}{13} + 3.47 =$ _____ .

7 Calculate:

(1) $0.364 + 34\frac{14}{17} + 63.6\% + \frac{3}{17} + 30\%$

(2) $3.72 + 40\% + 28\% + 48\frac{7}{15} + 0.6$

(3) $74\frac{3}{13} + 34.54 + \frac{9}{13} - 54\% + \frac{1}{13} + 29$

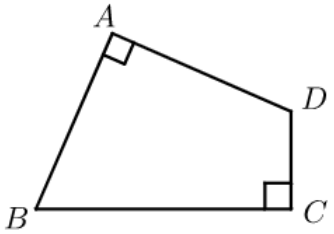
(4) $34.9\% + 83\frac{2}{9} + 5.1\% + 0.4 + \frac{7}{9}$

NOTE

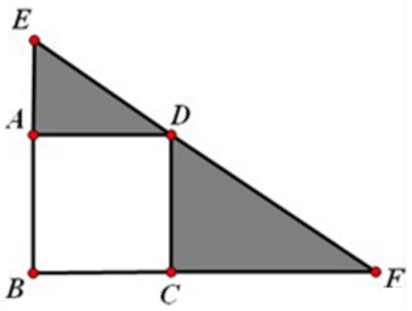
Geometry

Cutting and Rearranging Shapes

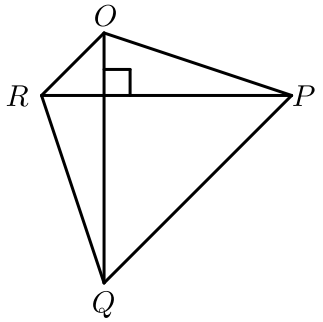
1 As shown below, in quadrilateral $ABCD$, $\angle BAD = \angle C = 90^\circ$, $AB = AD$, and $BC + CD = 10$. The area of the quadrilateral $ABCD$ is _____ cm^2.



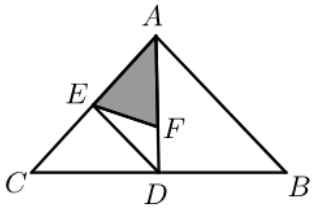
2 As shown below, square $ABCD$ is in triangle EBF. $DE = 12$ cm, $DF = 15$ cm. The area of the shaded part is _____ cm^2.



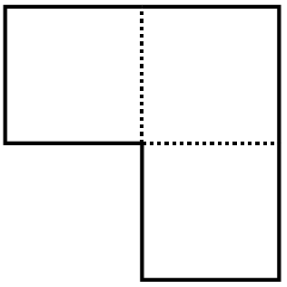
3 Quadrilateral $OPQR$ has two diagonals perpendicular to each other. Given $OQ = 8$ and $PR = 10$, the area of the quadrilateral is _____ .



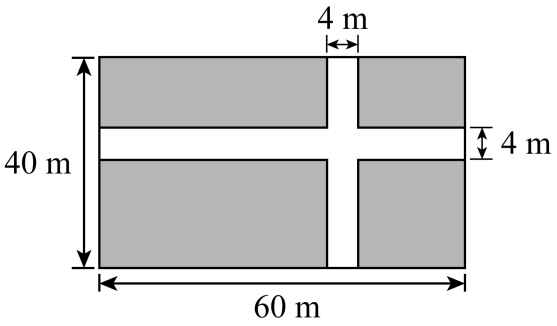
4 As shown in the figure, in triangle ABC, D is the midpoint of BC, $AE = EC$, $AF = 2DF$. The area of the shadow part is 2, then triangle ABC _____ .



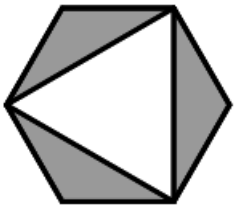
5 The following graph consists of 3 identical squares. Divide the graph into 4 parts with equal areas and identical shapes.



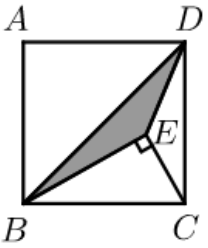
6 There is a rectangular garden with a length of 60 m and a width of 40 m as shown below. The shaded area is the grassland in the garden and the white area is the path. The width of the path is 4 m. The area of the grassland in the garden is _____ m^2.



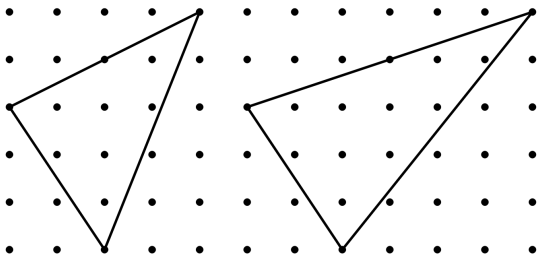
7 In the regular hexagon as shown below, the shaded area is 144. The area of the regular hexagon is _____ .



8 As shown below, in square $ABCD$, $\angle BEC = 90^\circ$, and $BE = 4$, $CE = 2$. The area of triangle BDE is _____ .



9 As the picture shown below, the distance between neighboring points is 1. Two triangles were created by connecting some of the points. What are the areas of these triangles, respectively?



10 Find the area of the shaded parts in the figures below.

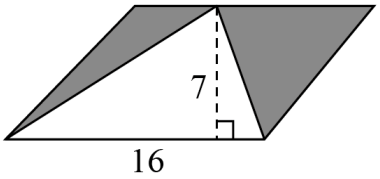


Figure 1

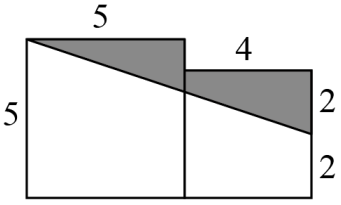
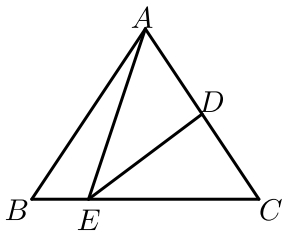
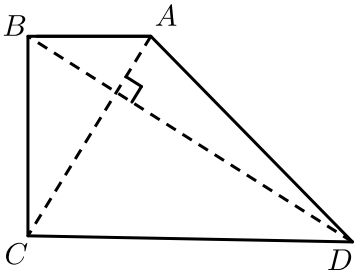


Figure 2

11 The area of triangle ABC is 50. Given that $EC = 4BE$ and $AD = CD$, find the area of triangle ADE.

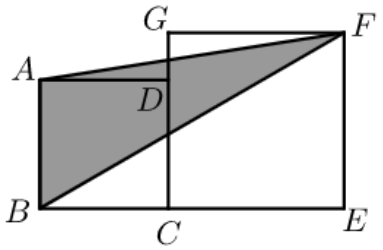


12 Given that AC is perpendicular to BD and the area of figure $ABCD$ is 80 cm^2, $AC = 10$, so what is the length of BD?

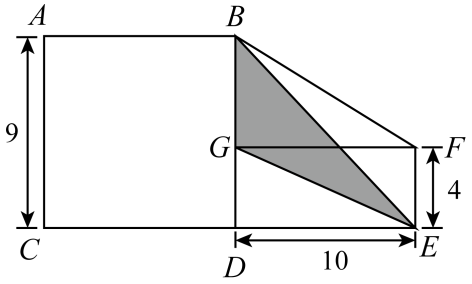


Different Shapes with the Same Base and Height

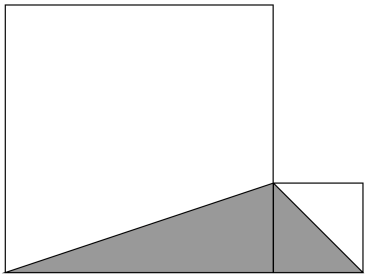
1 As shown in the figure, the side length of the square $ABCD$ is 10, and the side length of the square $CEFG$ is 14. The area of triangle ABF is _____ .



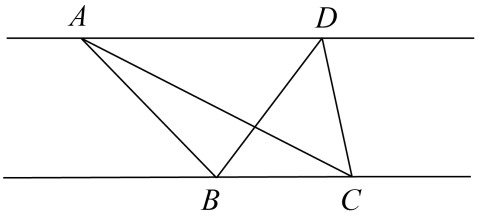
2 A rectangle, with a length of 10 and a width of 4, is next to a large square as shown below. The length of each side of the square is 9. Find the area of the shaded triangle and that of $\triangle BGF$, and compare them.



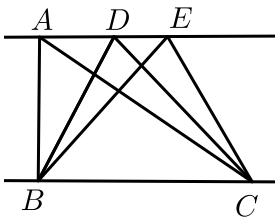
3 As shown below, two squares are placed next to each other. The side length of the big square is 12 cm and the side length of the small square is 4 cm. What is the area of the shaded part?



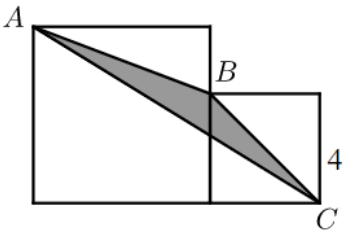
4 In the figure below, $AD//BC$. Given that the area of $\triangle ABC$ is 40, find the area of $\triangle DBC$.



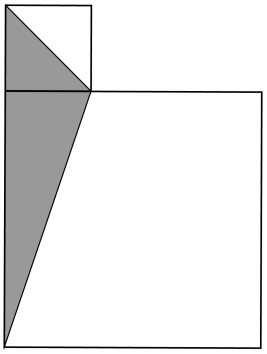
5 In the figure below, $AE//BC$. Given that $BC = 18$, and the distance between point A and side BC is 12, what is the area of triangle BEC?



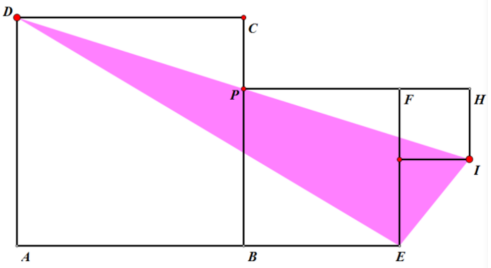
6 In the figure below, it is composed of one large square and one small square. And the side length of the small square is 4, and the area of the triangle ABC is _____ .



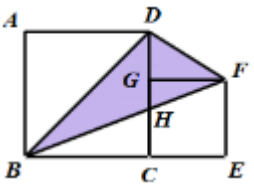
7 As shown below, a small square is put right on top of a big square. The side length of the big square is 25 cm and the side length of the small square is 5 cm. What is the area of the shaded part?



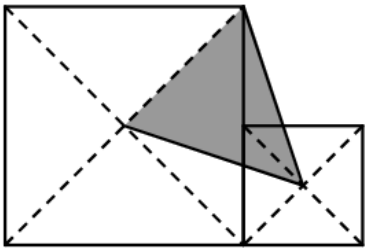
8 As shown below, we can see 3 squares. $PB = BE = 10$, the area of triangle DEI is _____ .



9 As shown below, we can see square $ABCD$ and square $CEFG$. $AD = AB = BC = CD = 20$. The area of triangle BFD is _____ .



10 This figure is composed of one large and one small squares, the side length of the small square is 2, the area of the shadow part is 8. The two vertices of the triangle are the center point of the large and small square, so how much is the large square area larger than the small square ?



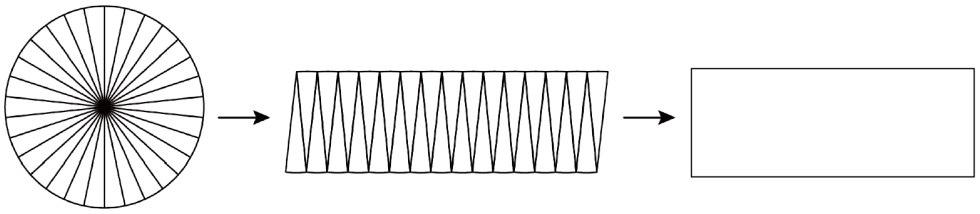
Circle

1 The minute hand of a clock is 12 cm long, the tip of the half-hour minute hand can go _____ cm, and the area swept by the minute hand is _____ cm^2. ($\pi = 3$)

2 As shown in the picture below, a circle is divided equally into many pieces to make a shape close to a rectangle.

(1) The radius of this circle is 2 cm. Thus, the width of the rectangle is _____ cm and the length of the rectangle is _____ cm. Therefore, the area of this circle is equal to the area of the rectangle, which is _____ cm^2. ($\pi \approx 3$)

(2) Suppose the radius of a circle is r, then the area of the circle can be represented as _____ . (Keep π in your answer)



3 A circle, the radius increased by 40%, its area increased by _____ $\%$.

4 A circle with a radius of 3 m, if the radius is increased by 1 m, the circumference is increased by _____ m and the area is increased by _____ m^2. $(\pi \approx 3)$

5 If the radius of the circle increases 1 cm, the circumference of the circle increases _____ cm. (Keep π in the answer.)

6 The diameter of a circular table is 4 m. The circumference of the table is _____ m and the area of the table is _____ m^2. $(\pi \approx 3)$

7 If the radius of the large circle is twice that of the small circle, then the circumference of the large circle is _____ times that of the small circle.

8 The area of a circle is 36π m^2. The circumference of the circle is _____ m. (Keep π in the answer.)

9 Circle A is surrounded by a 3.14 m rope and circle B with a 9.42 m rope, so the area of circle B is _____ times that of circle A. ($\pi = 3.14$)

10 The diameter of a circular dining table is 2 m. The circumference of the table is _____ m and the area of the table is _____ m^2. ($\pi \approx 3$)

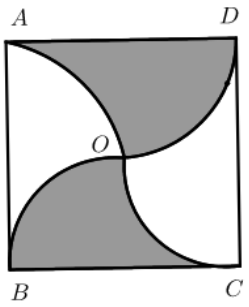
11 Irene has made a circular fence for her garden. The diameter of her fence is 5 m. The circumference of the circle is _____ m. (Keep π in the answer.)

12 The area of a circle is 50.24 m^2. The circumference of the circle is _____ m. ($\pi = 3.14$)

13 The area of a circular swimming pool is 16π m^2. The circumference of the swimming pool is _____ m. (Keep π in the answer.)

Half-Area Model

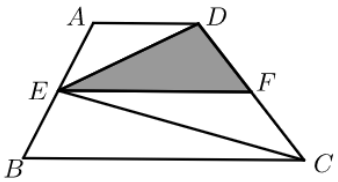
1 As shown below, the side length of the square is 10. The area of the shaded part is _____ .



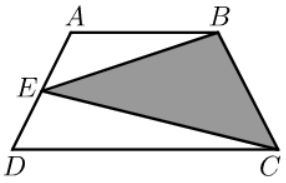
2 As shown in the figure, the area of trapezoid $ABCD$ is 200, E is the midpoint of AB, and F is the midpoint of DC.

(1) The area of triangle DEC _____ .

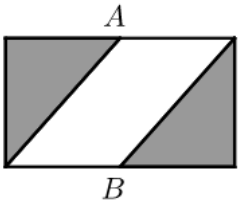
(2) The area of the shaded part is _____ .



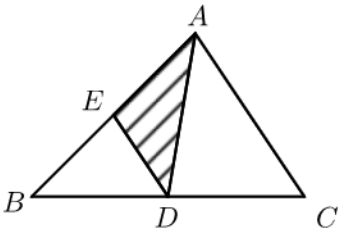
3 As shown in the figure, the area of trapezoid $ABCD$ is 10, and E is the midpoint of AD. The area of the shaded part is _____ .



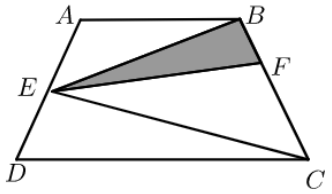
4 The area of the rectangle is 84, and the two points of A and B are the middle of the upper and lower lengths, respectively. The area of the shaded part is _____ .



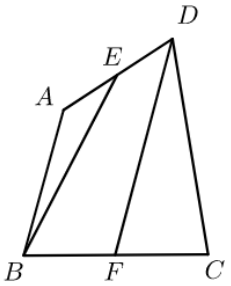
5 As shown in the figure, D and E are the midpoints of BC and AB in triangle ABC, respectively. If the area of the shaded part is 1, what is the area of triangle ABC?



6 As shown in the figure, the area of trapezoid $ABCD$ is 180, E is the midpoint of AD, F is the third equal point of BC. The area of the shaded part is _____ .



7 As shown in the figure, E and F are midpoints of AD and BC, respectively. The area of triangle ABE is 10, and the area of triangle CDF is 24. The area of quadrilateral $ABCD$ is _____ .



NOTE

Word Problem

Lining Up Problem

1. James is lining up to watch a movie. He is the 16th person counting from front to back in the line, and there are as many people in front of him as behind him. There are _____ people in the line.

2. Lucy is lining up to buy candy. She is the 8th person counting from front to back in the line, and there are as many people in front of her as behind her. There are _____ people in the line to buy candy.

3 Linda is lining up to pay a bill. Counting from front to back, she is the 6th person in the line. Counting from back to front, she is the 16th person. There are _____ people in the line.

4 Nathen is in a line to buy some sweets. The line is so long that there are 20 people in front of him and 15 people behind him. There are _____ people in the line.

5 Selena is lining up to buy an ice cream. Counting from front to back, she is the 10th person in the line. Counting from back to front, she is the 3rd person. There are _____ people in the line.

6 Tom is in a line to buy the latest music album for his sister. The line is so long that there are 9 people in front of him and 18 people behind him. There are _____ people in the line to buy the latest music album.

7 Ellie is lining up to buy the movie ticket. Counting from front to back, she is the 9th person in the line. Counting from back to front, she is the 23rd person. There are _____ people in the line.

8 Jackie is lining up to watch the show in a theater. She is the 28th person counting from front to back in the line, and there are as many people in front of her as behind her. There are _____ people in the line to watch the show.

9 Jack is in a line to buy the toy bear. The line is so long that there are 16 people in front of him and 19 people behind him. There are _____ people in the line to buy the toy bear.

Planting Trees Problem

1 There are 20 steps between each floor. Nate lives on the sixth floor, so he needs to walk _____ steps to reach his floor.

2 One piece of wood can be cut into _____ sections with 4 cuts.
One piece of wood can be cut into _____ sections with 9 cuts.
One piece of wood can be cut into _____ sections with 23 cuts.
(Cut the wood in the same way as shown below.)

3 We need to make _____ knots to make 10 short ropes linked together like the picture below.

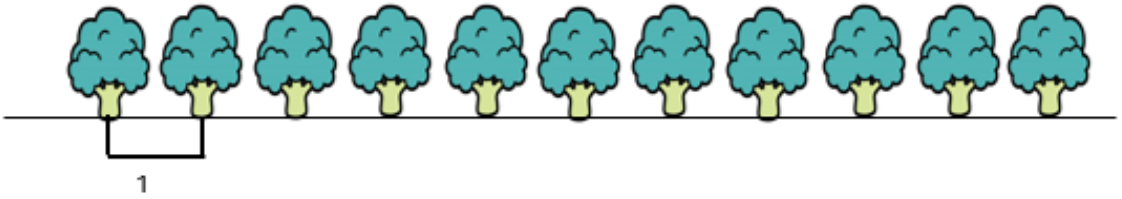
4 Dr. Lee is going to take home several pieces of rope. Each time, he will cut the rope in the middle. How many pieces would the rope be cut into when he makes three cuts?

5 There are 13 trees on one side of the road in the park, and there are 2 poles between each two adjacent trees. How many poles are there?

6 Aimee lives on the third floor of a building and there are 12 steps between each floor. So she has to walk _____ steps to go home.

7 120 students in grade 3 are now standing in a queue. If there are 4 students in each row and the distance between every two rows is 1 meter, how long is the line?

8 Tom plants trees on one side of the road. He plants 1 tree every 1 meter, and plants 11 trees in total. How long is the road?



9 7 girls are in a line. If the teacher asks to add 5 boys between every 2 girls, how many boys can be added?

10 How many times does it take to cut a piece of wood into 3 sections? If each cut takes 3 minutes, how long will it take?

11 There are 4 nails in each overlap of two blocks. How many nails are in need to nail 9 blocks into a long strip of wood like the picture below?

Find the Cycle

1. One day, Emily and her classmates plant trees in the following continuous pattern: a poplar tree, two coconut trees, and two pine trees. What is the 88th tree?

2. There is a number sequence as shown below:
$1, 3, 5, 7, 9, 1, 3, 5, 7, 9, 1, 3, 5, 7, 9, \cdots$
There are 28 numbers in this sequence in total. The sum of these 28 numbers is _____ .

3

According to the pattern in the figure above, what is the 30th figure counting from left to right? How many ☆ are there in the first 50 figures?

4 There is a number sequence as shown below:

$2, 5, 8, 1, 3, 5, 7, 9, 1, 3, 5, 7, 9, 1, 3, 5, 7, 9, \cdots$

There are 34 numbers in this sequence in total. The sum of these 34 numbers is _____ .

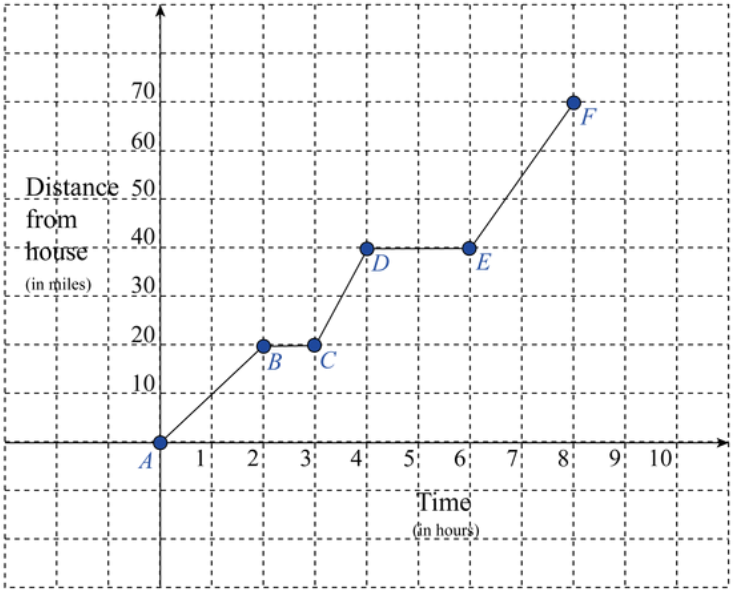
5 While watching a performance, students are lining up in the following continuous pattern: 2 girls, 2 boys, 4 girls, 3 boys, 4 girls, 3 boys, 4 girls, 3 boys …. Is the 41st student a boy or a girl? How about the 58th student?

6 While watching a performance, students are lining up in the following continuous pattern: 3 girls, 5 boys, 3 girls, 5 boys, …. Is the 35th student a boy or a girl? How about the 69th student?

Distance, Time, and Speed

1 Every Saturday, Ellen visits her friend in the town nearby. At $7:30$ a.m., Ellen leaves home and rides a bike to the train station at a speed of 10 miles per hour. At $8:30$ a.m., Ellen arrives at the train station and gets on a train that travels at a speed of 50 miles per hour. At $10:30$ a.m., Ellen arrives in the town. How many miles does Ellen travel in total every Saturday?

2 The distance-time graph below shows the journey of Ella when she went on a road trip during the summer. Answer the questions.



(1) How long did Ella rest during this journey? (Hint: there is more than one rest part)

A. Three hours B. One hour C. Half an hour

(2) What was the total distance in this journey?

A. 65 miles B. 70 miles C. 830 miles

(3) What was the speed of Ella from point C to point D?

A. 40 miles per hour B. 20 miles per hour C. 30 miles per hour

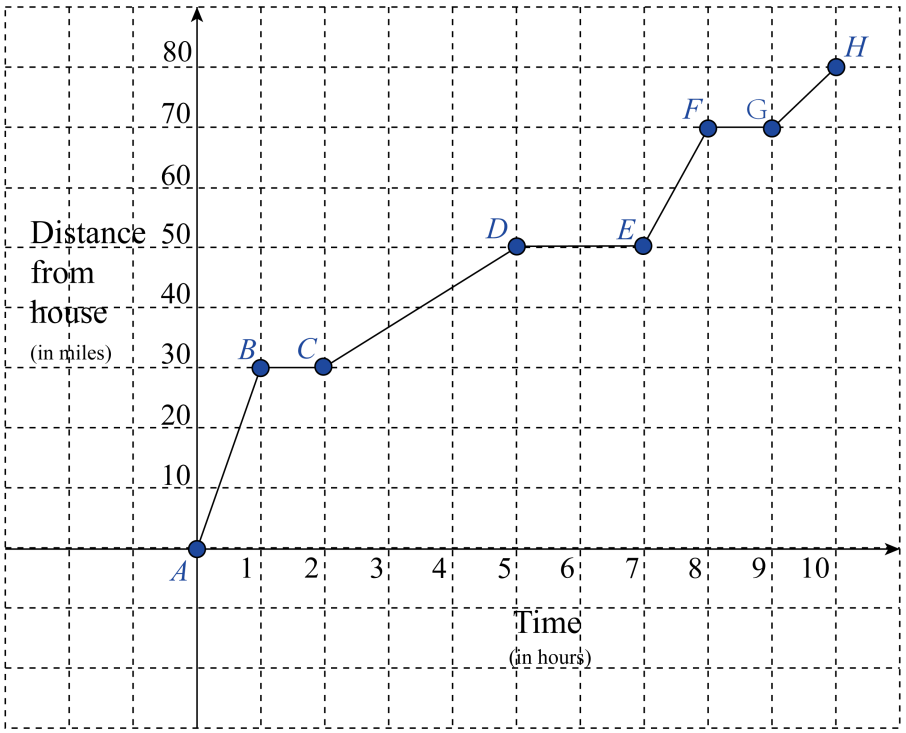
3 Jennie travels at a speed of 4.5 miles per hour. If Peter travels at a speed that is four times that of Jennie, how long will it take Peter to get to the airport that is 54 miles away?

(1) First, we can get that Peter's speed is _____ miles per hour.

(2) Then, we can find that it takes Peter _____ hours to travel 54 miles.

4 The distance between A and B is 200 km, and it takes Amy 8 hours to travel from A to B. With the same speed, if it takes Amy 6 hours to travel from A to C, the distance between A and C is _____ km.

5 The distance-time graph below shows the journey of Barnes when he went on a road trip along the coastline. Answer the questions.



(1) How long did Barnes rest during this journey? (Hint: there are more than one rest part)

A. Three hours B. Four hours C. One hour

(2) What was the total distance in this journey?

A. 65 miles B. 70 miles C. 80 miles

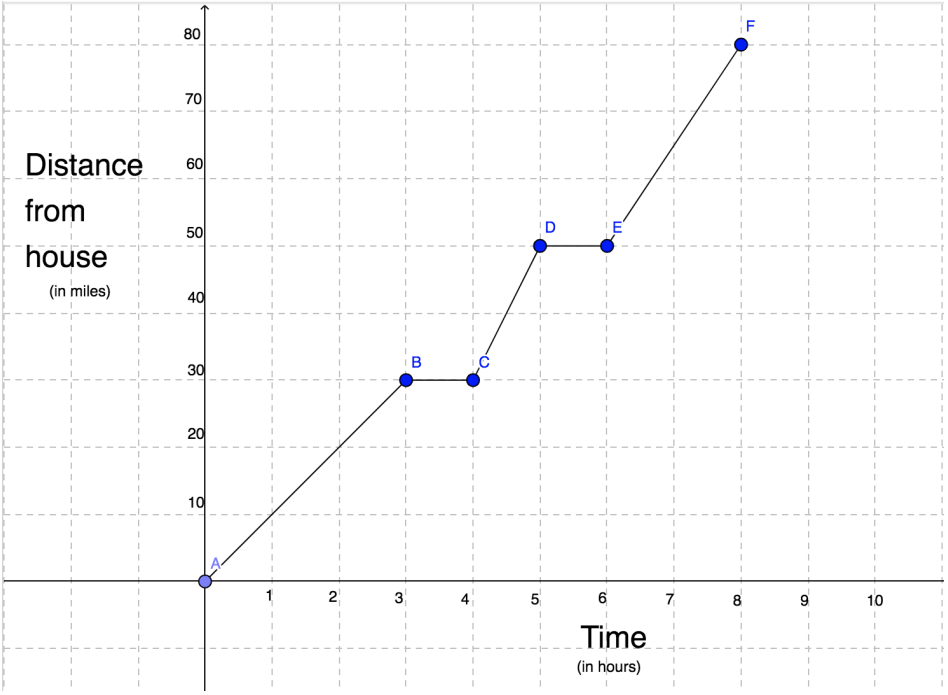
(3) What was the speed of Barnes from point A to point B?

A. 30 miles per hour B. $\frac{20}{3}$ miles per hour

C. 40 miles per hour

6 Every Sunday, Lisa visits her family in the nearby town. At $8:30$ a.m., Lisa leaves home and rides a motorcycle to the train station at a speed of 20 miles per hour. At $9:00$ a.m., Lisa arrives at the train station and gets on a train that travels at a speed of 55 miles per hour. At $11:00$ a.m., Lisa arrives in the town. How many miles does Lisa travel in total every Sunday?

7 The distance-time graph below shows the journey of John when he went out for a drive in his car. Answer the questions.



(1) How long did John rest during this journey?

A. Half an hour *B*. One hour *C*. Two hours

(2) What was the total distance in this journey?

A. 40 miles *B*. 80 miles *C*. 100 miles

(3) What was the speed of John from point C to point D?

A. 20 m/h *B*. 40 m/h *C*. 60 m/h

8 Lucy's travel speed is 2 miles per hour. If Luke's travel speed is twice that of Lucy, how long will it take Luke to get to school which is 20 miles away?

First, we can get that Luke's travel speed is _____ miles per hour.

Then, we can find that it takes Luke _____ hours to travel 20 miles.

9 Jade, Maggie, and Jack talk about how they get to a shopping mall from home.

(1) Jade says: "I always walk to the mall. It takes me 35 minutes." Given that Jade's walking speed is 40 meters per minute, then Jade's home is _____ meters away from the mall.

(2) Maggie says: "My uncle usually drives me to the mall." Given that Maggie's home is 4500 meters away from the mall, and her uncle's driving speed is 900 meters per minute, then it takes Maggie _____ minutes to get to the mall from home.

(3) Jack says: "I take bus to the mall each time. It takes me 15 minutes." Given that Jack's home is 3000 meters away from the mall, the speed of the bus is _____ meters per minute. (Time waiting for bus is not considered.)

10 The distance between A and B is 350 km, and it takes Ross 7 hours to travel from A to B. Assume her speed is unchanged. If it takes Ross 4 hours to travel from A to C, the distance between A and C is _____ km.

11 Answer the following questions.

(1) A boat travels at a speed of 35 km/h in still water. If the speed of the current is 4 km/h, what is the speed of the boat when traveling downstream? What is the speed of the boat when it travels upstream?

(2) A boat travels at a speed of 21 km/h in still water. If it travels downstream at a speed of 26 km/h, what is the speed of the current? What is the speed of the boat if it travels upstream?

(3) A boat travels downstream at a speed of 24 km/h and travels upstream at a speed of 18 km/h. What is the speed of the current? What is the speed of the boat in still water?

12 A 250-m long train is moving at a speed of 30 m/s. How long does it take the train to entirely cross a 260-m long bridge?

13 It takes a train 11 s to entirely pass a tree. Find the speed of this train if its length is 550 m. (The width of the tree is negligible.)

14 Crystal practices for a 3000–meter race to prepare for Think Olympics. If her running speed is 200 meters per minute, she can exactly finish the full distance in her scheduled time. However, her current running speed is 150 meters per minute. Therefore, within the scheduled time, she can run _____ meters.

15 (1) Robert walks at a speed of 1.5 m/s. It takes him 40 min to walk to the supermarket from his home. What is the distance between his home and the supermarket?

(2) Natasha rides a bike for 6400 m in 800 s. What is her speed?

(3) Clint runs at a speed of 3.5 km/h. How long will it take him to run a 28-km marathon?

(4) By solving the problems above, we can conclude that: (fill in the blanks with the correct options)

Distance = _____ × _____

Speed = _____ ÷ _____

Time = _____ ÷ _____

A. Speed B. Time C. Distance

16 (1) Angie's speed is 3 m/s. It takes her 30 min to get to her friend's home from her home. What is the distance between her home and her friend's home?

(2) Iris rides 3200 m in 800 s. What is her speed?

(3) Sam's running speed is 5 km/h. How long will it take him to run a 30 km race?

17 Candace makes an appointment at the library and now she is walking to the library which is 2000 meters away from her dorm. If she runs at the speed of 200 meters per minute, she can exactly arrive at the library on time. However, she takes too much thing with her, and she can only walk at the speed of 100 meters per minute. Within the scheduled time, she can walk _____ meters.

18 Andrew takes 600−meter race. His competitor's running speed is 300 meters per minute. However, his running speed is 200 meters per minute. Therefore, when the competitor reaches the destination, Andrew runs _____ meters.

Inclusion and Exclusion

1 There are 250 students standing in a line facing the teacher. From the left to the right of the line, each student counts off a number from 1 to 250. Then, the teacher asks the students with numbers that are multiples of 8 to turn backward. Next, the teacher asks the students with numbers that are multiples of 10 to turn backward. Now, how many students are facing the teacher?

2 All students in a class can either play basketball or football, or play both. Among them, 25 students can play basketball, 13 students can play football, and 9 students can play both. Find the number of students in this class.

3 A group of 40 students go to the supermarket to prepare for their picnic. 11 students pick only snacks, 12 students pick both snacks and drinks, and 9 students pick neither snacks nor drinks. Find the number of students who pick only drinks.

4 All students in a class can either play the guitar or the piano, or play both. Among them, 34 students can play the guitar, 17 students can play the piano, and 11 students can play both. Find the number of students in this class.

5 All students in a class can either read English or Chinese, or read both. Among them, 18 students can read English, 15 students can read Chinese, and 7 students can read both. Find the number of students in this class.

6 There are 310 workers standing in a line facing the director. From the left to the right of the line, each worker counts off a number from 1 to 310. Then, the director asks the workers with numbers that are multiples of 9 to turn backward. Next, the director asks the workers with numbers (including those who have turned backward once) that are multiples of 12 to turn backward. Now, how many workers are facing the director?

7 A group of 50 people go shopping for snacks. 14 people pick only cookies, 5 people pick both cookies and ice cream, and 8 people pick neither of the two snacks. Find the number of people that pick only the ice cream.

Find the Unit

1. Eight workers in the factory assemble 72 engines in 3 hours. Each worker can assemble the same amount of engines each hour. How many engines can 24 workers assemble in an hour?

2. Ten workers in the factory produce 150 dolls in 5 hours. Each worker can produce the same number of dolls each hour. How many dolls can 17 workers produce in an hour?

3 Ben and his friends make some paper boats in the craft classes. Seven people can make 150 paper boats in 25 minutes. Everyone makes the same number of paper boats each hour. How many paper boats can seven people make in 1 minute?

4 Chris and his colleagues are folding some envelopes for mails. Nine people can make 200 envelopes in 40 minutes. Everyone folds the same number of envelopes each hour. How many envelopes can nine people make in 1 minute?

5 Halloween is coming! Nini and her friends make some pumpkin pies. Five people can make 12 pumpkin pies in 3 hours. Everyone makes the same number of pumpkin pies each hour. How many pies can 5 people make in 1 hour ?

Meeting Problem

1 The distance between A and B is 720 km. Tom and Kelly depart at the same time and travel towards each other. Every hour, Tom travels 65 km and Kelly travels 55 km. Tom and Kelly in total travel _____ km per hour. They will meet in _____ hour(s).

2 Jennifer and Lisa travel toward each other from their houses, respectively, and it takes 3 hours for them to meet. Jennifer runs 9 kilometers per hour and Lisa walks 6 kilometers per hour. What is the distance between their houses?

3 The distance between May's house and Skye's house is 50 miles. They drive towards each other from their houses at the same time. May drives at a speed of 6 miles per hour and Skye drives at a speed of 4 miles per hour. How long does it take for them to meet?

4 Ada and Sara ride towards each other at the same time from A and B, respectively. Ada rides at a speed of 20 miles per hour and Sara rides at a speed of 23 miles per hour. Sara takes a break on the way for 1 hour. Eventually, it takes them 5 hours in total to meet with each other. What is the distance between A and B?

5 The distance between truck A and truck B is 400 km. Two trucks depart at the same time and travel towards each other. Every hour, truck A travels for 90 km and truck B travels 110 km. The two cars in total travel _____ km per hour. They will meet in _____ hour(s).

6 The distance between terminal A and terminal B is 2500 m. Alison and Mason depart from airport A and airport B, respectively, and head toward the same direction. Alison's speed is 60 m/min and Mason speed is 35 m/min. It takes Alison _____ minutes to catch up with Mason. If Alison wants to catch up with Mason in 50 min, her speed needs to be _____ m/min.

Chasing Problem

1 The distance between A and B is 3000 m. Rogers and Barnes depart from A and B, respectively, and head toward the same direction. Rogers' speed is 150 m/min and Barnes' speed is 90 m/min. It takes Rogers _____ minutes to catch up with Barnes. If Rogers wants to catch up with Barnes in 40 min, his speed needs to be _____ m/min.

2 The distance between the museum and the park is 3000 m. Joey and Ross depart from the museum and the park, respectively, and head toward the same direction at the same time. Joey's speed is 160 m/min and Ross' speed is 110 m/min. It takes Joey _____ minutes to catch up with Ross. If Joey wants to catch up with Ross in 40 min, his speed needs to be _____ m/min.

3 Bruce starts from a place that is 400 meters ahead of where Natasha starts off and they head toward the same direction. Natasha rides a bike at a speed of 450 meters per minute, and Bruce runs at a speed of 250 meters per minute. Assume that their speeds are unchanged. How long does it take for Natasha to catch up with Bruce?

4 The distance between the supermarket and school is 2700 m. David and Charles depart from the supermarket and school, respectively, and head toward the same direction. David's speed is 120 m/min and Charles' speed is 93 m/min. It takes David _____ minutes to catch up with Charles. If David wants to catch up with Charles in 50 min, his speed needs to be _____ m/min.

5 Krystal starts from a place that is 750 meters ahead of where Jessica starts off and they head toward the same direction. Krystal runs at a speed of 125 meters per minute, and Jessica rides a bike at a speed of 375 meters per minute. Assume that their speeds stay constant. How long does it take for Jessica to catch up with Krystal?

6 Dylan was walking to the park to do morning exercise. He walked 76 meters per minute. 25 minutes after his departure from home, Dylan's sister decided to join the morning exercise and rode a bike to catch up with Dylan. Assume that their speeds stayed constant. Given that Dylan's sister rode a bike at a speed of 126 meters per minute, how long did it take for her to catch up with Dylan?

7 The distance between airport A and airport B is 4200 m. Amy and Bob depart from airport A and airport B, respectively, and head toward the same direction at the same time. Amy's speed is 110 m/min and Bob's speed is 70 m/min. It takes Amy _____ minutes to catch up with Bob. If Amy wants to catch up with Bob in 70 min, her speed needs to be _____ m/min.

Chicken-Rabbit Problem

1. A total of 10 ducks and dogs are caged together. If there are 26 legs in total, how many ducks and dogs are there, respectively?

2. There are 45 classrooms in the building. A large classroom can accommodate 40 students, while a small classroom can only accommodate 15 students. Given that there are 800 students in this building, how many large rooms are there?

3 A total of 56 chickens and kittens are kept in the same box. If there are 148 legs in total, how many chickens and kittens are there, respectively?

4 Kenny is observing some crickets and spiders in a box. A cricket has 6 legs, while a spider has 8 legs. He finds that there are 9 heads and 60 legs in total. How many crickets and spiders are there, respectively?

5 Jennie is observing some crickets and spiders in a box. A cricket has 6 legs, while a spider has 8 legs. She finds that there are 14 heads and 98 legs in total. How many crickets and spiders are there, respectively?

6 A total of 44 chickens and rabbits are caged together. If there are 96 legs in total, there should be _____ chickens and _____ rabbits inside the cage.

7 A total of 15 parrots and kittens are kept in the same box. If there are 44 legs in total, how many parrots and kittens are there, respectively?

8 There are 250 bottles of water prepared for 100 people during a marathon. If every runner gets 4 bottles of water and every volunteer gets 2 bottle, how many runners and volunteers are there, respectively?

9 A total of 20 pigeons and cats are caged together. If there are 54 legs in total, how many pigeons and cats are there, respectively?

NOTE

NOTE

Number Theory

Prime Number

1 The product of two consecutive non-zero natural numbers is a multiple of 1311. What is the least possible sum of the two natural numbers?

2 Find the prime factorizations of the following numbers:

(1) 285

(2) 343

(3) 1771

3 According to the meaning of power, we can get: $5^5 = 5 \times 5 \times 5 \times 5 \times 5$, and $5^3 = 5 \times 5 \times 5$. Therefore, $5^5 \div 5^3 = (5 \times 5 \times 5 \times 5 \times 5) \div (5 \times 5 \times 5) = 5^2$. (Write the answers in exponential form)

(1) $6^9 \div 6^5 =$ _____

(2) $a^p \div a^q =$ _____ $(p \geqslant q)$

(3) Calculate: $a^{12} \div a^{12}$ $(a \neq 0)$. According to this result, we can know $a^0 =$ _____ $(a \neq 0)$.

4 The product of all prime numbers between 1 and 10 is ( ) .

A. 210

B. 105

C. 1890

D. none of the above

5 Which of the following numbers is/are prime number(s)?

(1) 127

(2) 138

(3) 143

6 Answer the questions.

(1) Which of the following options are multiples of 15?

A. 31 B. 30 C. 45 D. 75 E. 52 F. 60

(2) Find the prime factorization of 15 and the prime factorization of the multiples of 15 in the options above.

Greatest Common Factor & Least Common Multiple

1 Find the greatest common factor of each pair of numbers below.

(1) 29, 41

(2) 99, 33

(3) 24, 36

2 Find the least common multiple of each pair of numbers below.

(1) 25, 50

(2) 13, 19

(3) 120, 72

3 (1) The greatest common factor of 54, 36 and 12 is _____ .

(2) The least common multiple of 24, 27 and 18 is _____ .

4 (1) Find the least common multiple of 6, 18 and 30.

(2) Find the least common multiple of 30, 15 and 60.

(3) Find the least common multiple of $2^3 \times 3$, 2^2 and $2^2 \times 3^2$.

5 (1) Find the least common multiple of 8, 4 and 12.

(2) Find the least common multiple of 60, 20 and 7.

(3) Find the least common multiple of $2^3 \times 5$, $2^4 \times 5$ and 2^4.

6 Find the greatest common factor of each pair of numbers below.
(1) 77, 100

(2) 10, 80

(3) 75, 45

7 (1) Find the least common multiple of 7, 4 and 12.

(2) Find the least common multiple of 54, 6 and 12.

(3) Find the least common multiple of $3^2 \times 5$, 3^3 and 3^2.

8 (1) The greatest common factor of 18, 36 and 27 is _____ .

(2) The least common multiple of 18, 36 and 27 is _____ .

9 (1) Find the least common multiple of 28, 4 and 16.

(2) Find the least common multiple of 72, 9 and 54.

(3) Find the least common multiple of $2^3 \times 3$, $2^3 \times 3^2$ and 3^2.

10 (1) Find the least common multiple of 12, 24 and 36.

(2) Find the least common multiple of 8, 9 and 16.

(3) Find the least common multiple of $2^3 \times 7$, 2^3 and $2^3 \times 3^2$.

11 Find the least common multiple of each pair of numbers below.

(1) 13, 52

(2) 11, 12

(3) 144, 96

12 (1) Find the least common multiple of 12, 24 and 60.

(2) Find the least common multiple of 15, 30 and 60.

(3) Find the least common multiple of 5×2, 5^2 and 5^3.

13 (1) Find the least common multiple of 8, 27 and 12.

(2) Find the least common multiple of 21, 7 and 14.

(3) Find the least common multiple of 5×6, 5^2 and 5^3.

14 (1) The greatest common factor of 24, 27 and 18 is _____ .

(2) The least common multiple of 24, 27 and 18 is _____ .

15 Find the least common multiple of each pair of numbers below.

(1) 14, 42

(2) 11, 10

(3) 26, 39

16 Find the least common multiple of each pair of numbers below.

(1) 12, 48

(2) 9, 13

(3) 51, 34

17 (1) The greatest common factor of 15, 25 and 20 is _____ .

(2) The least common multiple of 15, 25 and 20 is _____ .

18 Find the greatest common factor of each pair of numbers below.

(1) 90, 101

(2) 9, 36

(3) 24, 18

19 (1) Find the least common multiple of 8, 16 and 9.

(2) Find the least common multiple of 2, 3 and 8.

(3) Find the least common multiple of 2×7, $2^2 \times 7$ and 2^2.

20 Find the greatest common factor of each pair of numbers below.

(1) 22, 35

(2) 8, 72

(3) 46, 69

21 Find the least common multiple of each pair of numbers below.

(1) 11, 55

(2) 8, 15

(3) 81, 72

22 Find the greatest common factor of each pair of numbers below.

(1) 13, 19

(2) 36, 108

(3) 125, 75

23 Find the least common multiple of each pair of numbers below.

(1) 19, 57

(2) 11, 13

(3) 22, 33

24 (1) Find the least common multiple of 28, 7 and 35.

(2) Find the least common multiple of 26, 14 and 13.

(3) Find the least common multiple of 3^2, 3^3 and 3^4.

25 Find the least common multiple of each pair of numbers below.

(1) 15, 105

(2) 8, 13

(3) 64, 72

26 (1) The greatest common factor of 6, 30 and 36 is _____ .

(2) The least common multiple of 6, 30 and 36 is _____ .

27 (1) The greatest common factor of 18, 9 and 36 is _____ .

(2) The least common multiple of 18, 9 and 36 is _____ .

28 Find the least common multiple of each pair of numbers below.

(1) 26, 104

(2) 12, 17

(3) 56, 64

29 (1) The greatest common factor of 54, 36 and 12 is _____ .

(2) The least common multiple of 24, 27 and 16 is _____ .

30 Find the least common multiple of each pair of numbers below.

(1) 13, 26

(2) 26, 11

(3) 56, 72

31 Find the greatest common factor of each pair of numbers below.

(1) 16, 17

(2) 30, 60

(3) 26, 16

32 Find the greatest common factor of each pair of numbers below.

(1) 45, 47

(2) 7, 77

(3) 34, 28

33 (1) The greatest common factor of 12, 15 and 30 is _____ .

(2) The least common multiple of 12, 15 and 30 is _____ .

34 (1) The greatest common factor of 49, 14 and 28 is _____ .

(2) The least common multiple of 49, 14 and 28 is _____ .

35 Find the least common multiple of each pair of numbers below.

(1) 25, 50

(2) 13, 19

(3) 120, 72

36 Find the greatest common factor of each pair of numbers below.

(1) 17, 31

(2) 19, 38

(3) 45, 54

37 Find the greatest common factor of each pair of numbers below.

(1) 23, 32

(2) 17, 34

(3) 30, 42

38 (1) The greatest common factor of 42, 14 and 28 is _____ .

(2) The least common multiple of 42, 14 and 28 is _____ .

39 (1) Find the least common multiple of 3, 4 and 5.

(2) Find the least common multiple of 12, 3 and 8.

(3) Find the least common multiple of $2^2 \times 3$, $2^3 \times 3$ and 3^3.

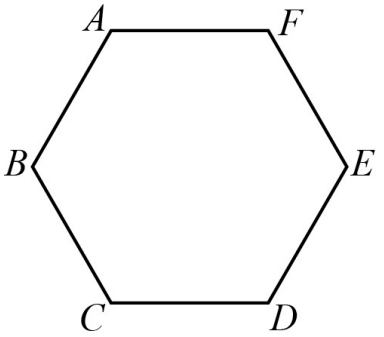
NOTE

NOTE

Crazy Math

AMC 8

1 The vertices of the regular hexagon $ABCDEF$ are marked by numbers. The sum of the numbers on each side is calculated. The sum of AB is 3, BC is 7 , CD is 12, DE is 19 and EF is 13. What is the sum of AF?

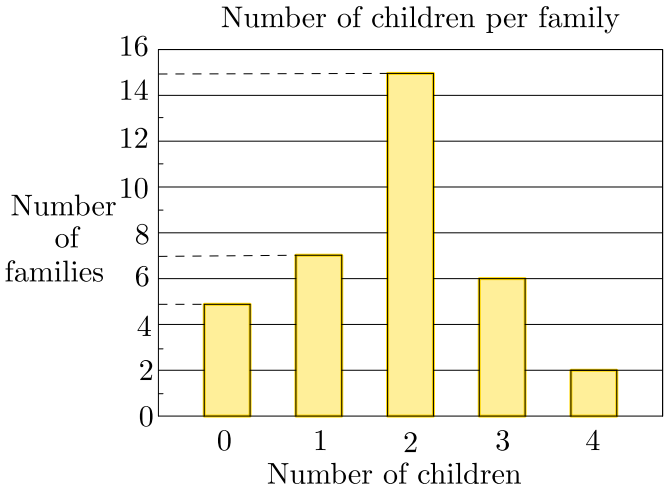


A. 2 B. 13 C. 15 D. 17 E. 21

2 A four-digit number is divisible by 9. Remove the last digit of the number. The resulted three-digit number is a multiple of 4. Among the possible choices, the least possible four-digit number that meets the conditions is _____ .

A. 1000 B. 1008 C. 9999 D. 9969 E. 100

3 The bar graph shows the number of children per family who live in a block of flats. What is the average number of children per family?



A. 1.5 B. 1.8 C. 2 D. 2.2 E. 2.4

4 If $a@b = ab + a + b$, and a and b are positive integers, then what is $3@4$?

A. 12 B. 15 C. 17 D. 19 E. 21

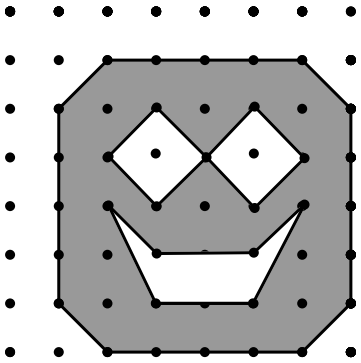
5 A total of 31 chickens and rabbits are caged together. If there are 94 legs in total, there should be _____ chickens inside the cage.

A. 10 B. 16 C. 15 D. 18 E. 20

6 There are six more girls than boys in Nini's class. The total number of students in her class is 30. What is the ratio of the number of girls to that of boys?

A. 7 : 8 B. 8 : 7 C. 9 : 11 D. 11 : 9 E. 3 : 2

7 As shown below, the distance between neighboring points is 1 cm. The smiling face as shown below is drawn by connecting some points. What is the area of the shaded region?



A. 25 cm^2 B. 28 cm^2 C. 27 cm^2 D. 35 cm^2 E. 30 cm^2

8 Peter is William's brother, and they live together. Peter and William are going to a supermarket that is one mile from their house. They leave home simultaneously. Peter rides his bicycle to the supermarket at a constant speed of 12 miles per hour. William walks to the supermarket at a constant speed of 4 miles per hour. How much does Peter arrive earlier than William in minute ?

A. 15 B. 5 C. 10 D. 8 E. 12

9 Calculate:

$(100 - 1 \times 19) \times (100 - 2 \times 18) \times \cdots \times (100 - 19 \times 1) =$ _____

A. 0 B. 3628800^2 C. $(10!)^2$ D. $(9!)^4$ E. $(2021)^5$

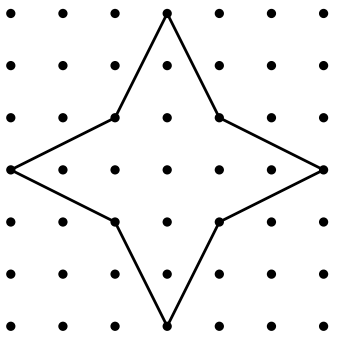
10 Bowen, Jack, and Peter received several gifts on their birthday. Bowen's gifts were three times that of Jack, and Peter's gifts were half of Bowen's. If the sum of all three people's gifts were 33, how many gifts did Peter receive?

A. 18 B. 8 C. 10 D. 9 E. 6

11 Cut a cube with a plane. Which of the followings cannot be the section made by the cut?

A. Rectangle
B. Pentagon
C. Heptagon
D. Trapezoid
E. Isosceles triangle

12 A figure is drawn on a piece of $1\text{cm} \times 1\text{cm}$ graph paper. What is the area of the figure in cm^2?



A. 6
B. 8
C. 10
D. 12
E. 14

13 It takes Clea 60 seconds to walk down an escalator when it is not operating, and only 24 seconds to walk down the escalator when it is operating. How many seconds does it take Clea to ride dowm the operating escalator when she just stands on it?

A. 36 B. 40 C. 42 D. 48 E. 52

14 $\overline{ab}$ is a 2-digit number. If $\overline{ab}+\overline{ba}$ is a perfect square, $a<b$, how many 2-digit numbers $\overline{ab}$ can you find?

A. 4 B. 5 C. 6 D. 7 E. 8

15 Eddie bought some tomatoes, potatoes, and carrots on the weekend. The weight of the tomatoes he bought is $\frac{2}{3}$ that of the potatoes. The weight of the potatoes he bought is $\frac{3}{4}$ that of the carrots. He bought 2.4 kg of tomatoes. What is the weight of the carrots he bought on the weekend?

A. 4.8 kg B. 3.6 kg C. 4 kg D. 5.6 kg E. 4.5 kg

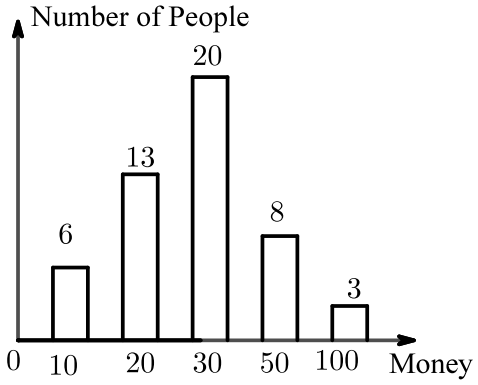
16 If $A = 1 + 3 + 5 + 7 + \cdots + 99$, and $B = 2 + 4 + 6 + \cdots + 100$, what is the value of $B - A$?

A. 0 B. 49 C. 50 D. 99 E. 100

17 The following clocks are 10 minutes fast, 25 minutes fast and 30 minutes slow, but we are not sure about the order. What is the correct time now?

A. 1 : 20 B. 1 : 30 C. 1 : 45 D. 1 : 50 E. 1 : 55

18 Fifty people donate money to an organization. Eddie makes the following diagram based on their contribution. Find the average amount of money donated by each person.



A. 20 B. 25 C. 30 D. 32.4 E. 32.8

19 At Think Academy, $\frac{2}{3}$ of the students like apples and $\frac{5}{6}$ of the students like oranges. At least _____ of the students like both fruits.

A. 10% B. 20% C. 30% D. 40% E. 50%

20 Suppose that $a \divideontimes b$ means $5a - 2b + 3$. What is the value of x if $x \divideontimes (4 \divideontimes 1) = 2x + 6$?

A. 12 B. 13 C. 14 D. 15 E. 16

21 There are 72 storybooks in the school library, and the number of magazines is $\frac{1}{3}$ that of storybooks. How many storybooks and magazines are there altogether?

A. 80 B. 81 C. 90 D. 96 E. 120

22 Which of the following fractions is the largest?

A. $\frac{1}{2}$ B. $\frac{2}{3}$ C. $\frac{3}{5}$ D. $\frac{5}{8}$ E. $\frac{8}{13}$

23 To buy a car, James paid $\frac{1}{3}$ of its price in the first month, then paid $\frac{1}{4}$ of its price in the second month. James still owes the car company $\$8000$. The price of the car is _____ .

A. $\$8000$ B. $\$24000$ C. $\$19200$ D. $\$28800$ E. $\$32000$

24 After a test, Amy, Tom, Staphanie, and Harry were guessing their results.
Amy said: "If I pass the test, Tom will also pass the test."
Tom said: "If I pass the test, Staphanie will also pass the test."
Staphanie said "If I pass the test, Harry will also pass the test."
On the next day, they found that all of them told the truth but only two of them passed the test. _____ and _____ didn't pass the test.

A. Amy; Tom
B. Tom; Staphanie
C. Staphanie; Harry
D. Staphanie; Amy

25 A book has n pages, numbered from 1 through n. A total of 99 digits are used to number the pages. What is n?

A. 50 B. 52 C. 54 D. 56 E. 58

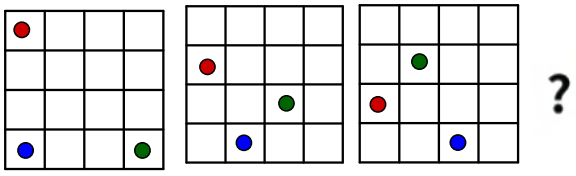
26 In Chinese chess, there are three results: 2 points for winning, 1 point for drawing, and 0 point for losing. Now 7 people plays a single round-robin (each team only play with each other once). Given that the scores of 6 of them are 9, 8, 7, 5, 5 and 3 respectively, the score of the last person is _____ .

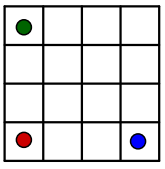
A. 2 B. 4 C. 5 D. 6 E. 8

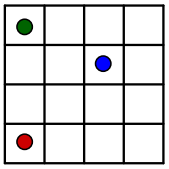
27 John bought 10 pencils and notebooks in total for $\$44$. Each pencil cost $\$2$. Each notebook costs $\$8$.
How many notebooks did John buy?

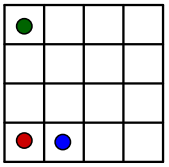
A. 4 B. 5 C. 6 D. 7 E. 8

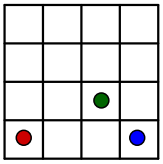
28 According to the regular pattern, the fourth picture is _____ .

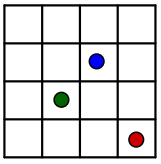


A. 

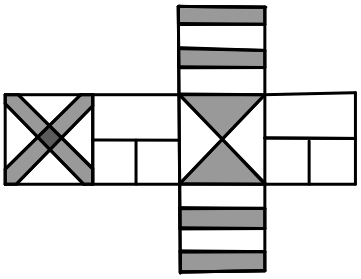
B. 

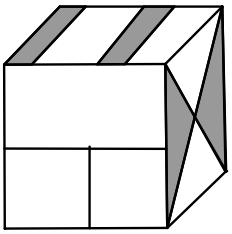
C. 

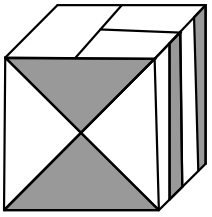
D. 

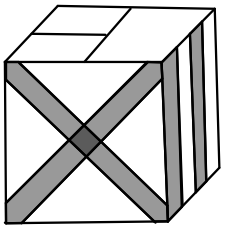
E. 

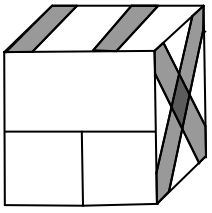
29 As shown below, the net to the right can form cube _____ .



A. 

B. 

C. 

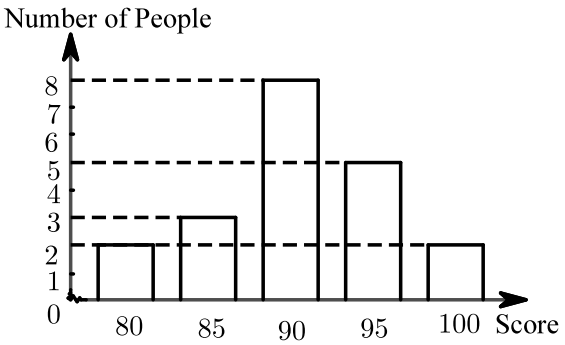
D. 

E. None of them is right.

30 There are 30 numbers, which are 1, 2, 3, 4,⋯, 30. If you choose one randomly, the probability that you get a prime number is _____ .

A. $\frac{2}{3}$ B. $\frac{3}{5}$ C. $\frac{3}{10}$ D. $\frac{7}{19}$ E. $\frac{1}{3}$

31 Twenty students participated in the Think Math Competition. The following gragh represents the scores of 20 students. What is the median of the scores?



A. 95 B. 85 C. 90 D. 100 E. 80

32 On the graduation ceremony, Teacher William takes photos with his four students. All of them stand in a line and they make Teacher William stand in the middle. There are _____ different ways for them to form the line.

A. 12 B. 16 C. 20 D. 24 E. 36

33 If $a@b = \dfrac{10a+b}{1001a+1001b}$, and a and b are positive integers, then what is $1@40$?

A. $\dfrac{1}{800}$ B. $\dfrac{25}{1927}$ C. $\dfrac{50}{41041}$ D. $\dfrac{5}{4141}$ E. $\dfrac{50}{4141}$

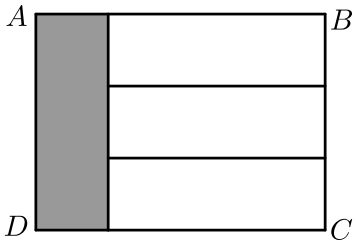
34 The numbers $-12, -1, 0, 11, 17$ are rearranged according to these rules:

1. The smallest isn't the first, but it is in one of the first three places.
2. The largest isn't the last, but it is in one of the last three places.
3. The median number is neither on the first place nor the last place.

What is the average of the first number and the last?

A. -6.5 B. -0.5 C. 5 D. 5.5 E. 8.5

35 Rectangle $ABCD$ is made up of 4 small identical rectangles. The perimeter of the shaded rectangle is 48 cm. What is the area of the shaded rectangle?



A. 108 cm B. 120 cm C. 128 cm D. 216 cm E. 180 cm

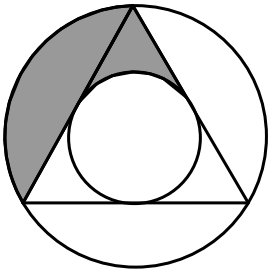
36 There are five candidates: A, B, C, D, and E in a chess game. Each two of them play a round. So far, A has played 4 rounds, B has played 3 rounds, C has played 2 rounds, and D has played 1 round. Thus, E has played _____ rounds.

A. 0 B. 1 C. 2 D. 3 E. 4

37 Form a number by randomly selecting four digits from $7, 0, 5, 4, 9$. The largest integer formed that is divisible by 2, 3 and 5 is _____ .

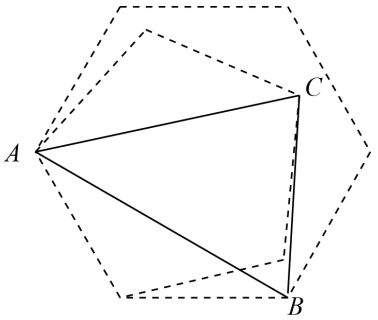
A. 9990 B. 9750 C. 9540 D. 7950 E. 4590

38 In the figure shown below, there is a equilateral triangle, its inscribed circle, and its circumcircle. The radius of the large circle is twice that of the small circle. The area of the inscribed circle is 30 cm^2. The area of the shaded region is _____ .



A. 20 cm^2 B. 30 cm^2 C. 40 cm^2 D. 50 cm^2 E. 60 cm^2

39 As shown in the figure below, there is a regular pentagon inside a regular hexagon. Find the measurement of $\angle A$ in triangle ABC.



A. 12° B. 24° C. 30° D. 42° E. 48°

40 A class has 20 students. All students have done math test twice. 5 students fail the first test, while 6 students fail the second test, and 14 students pass both tests. How many students fail both tests ?

A. 1 B. 2 C. 3 D. 4 E. 5

41 In a mathematics contest with 15 problems, a student gains 8 points for a correct answer and loses 2 points for an incorrect answer. If Peter answered every problem and his total score was 90, how many questions did he answer correctly?

A. 9 B. 10 C. 11 D. 12 E. 13

42 Calculate:

$$\left(1+\frac{1}{2}\right)\times\left(1+\frac{1}{3}\right)\times\left(1+\frac{1}{4}\right)\times\cdots\times\left(1+\frac{1}{2020}\right)=_____$$

A. $\frac{1}{2020}$ B. $\frac{2021}{4040}$ C. $\frac{1}{4040}$ D. $\frac{2021}{2}$ E. $\frac{2021}{2020}$

43 In the year 2021, Jack calculated that the value of the expression $2 \times 0 + 2 \times 1$ is:

A. 0 B. 1 C. 2 D. 3 E. 4

44 There are 5 coins on the table. Two coins each worth 100 cents, two coins each worth 50 cents, and one coin worths 5 cents. How many different total values of coins can be made with these coins? (Example: one 100 cents coin, one 50 cents coin, and one 5 cents coin can form a group.)

A. 16 B. 15 C. 14 D. 13 E. 12

45 The price of a chandelier first goes up for 20%, then goes down for 30%, and eventually goes up for 40%. After all three changes, the final price is _____ of the original price.

A. 86.4% B. 96.8% C. 100% D. 106.8% E. 117.6%

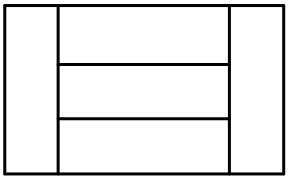
46 Suppose that real-numbers a, b satisfy $\sqrt{a-2022}+\sqrt{2022-a}=b$. What is the value of $a+b$?

A. 4044 B. -2022 C. 0 D. -4044 E. 2022

47 Compare $A = 2^{18} \times 3^{10}$, $B = 2^{10} \times 3^{15}$ and $C = 2^{11} \times 3^{14}$. The largest one of the three numbers is _____ .

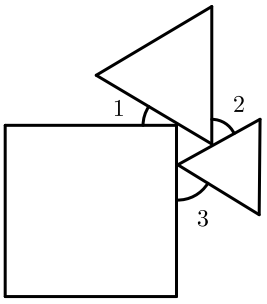
A. A B. B C. C D. A and B E. B and C

48 A large rectangle is formed by five small identical rectangles. If the perimeter of each small rectangle is 40 cm, the perimeter of the large rectangle is _____ cm.



A. 40 B. 60 C. 100 D. 80 E. 120

49 As shown in the figure below, there is a square and two equilateral triangles. If $\angle 3 = 50^\circ$, $\angle 1 + \angle 2 =$ _____ .



A. 90 B. 100 C. 110 D. 120 E. 130

50 The year 2020 is a Coach number (The first two digits of a four-digit number are equal to the last two digits). What is the product of the digits of the next year after 2020 that is a Cocah number?

A. 0 B. 1 C. 4 D. 16 E. 36

51 A four-digit number is divisible by 9. Remove the last digit of the number. The resulting three-digit number is a multiple of 4. Among the possible choices, the least possible four-digit number that meets the conditions is _____ .

A. 1000 B. 1008 C. 9999 D. 9969 E. 1001

52 A large square is formed by small squares of the same size. Among them, the small squares that are adjacent to the side of the large square are painted white. The other squares in the center are painted black. Figure 1 and Figure 2 show two examples of how the large squares are formed. The pattern continues. When 40 squares are painted white, _____ squares are painted black.

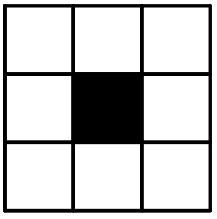


Figure 1

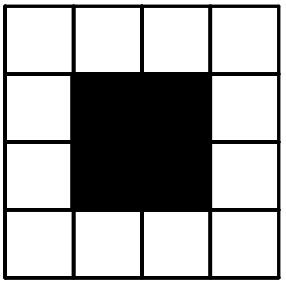


Figure 2

A. 121 B. 100 C. 81 D. 64 E. 49

53 Nini's hat has the words"Think Academy" written on it. What does she see on her hat when she looks in the mirror?

A.
B.
C.
D.
E.

54 What is the greatest common factor of 8^2 and 2^8?

A. 2^2 B. 2^3 C. 4^2 D. 4^3 E. 4^4

55 Fill in each box with numbers 1 to 9 so that the sum of 3 numbers in each row, column, and the two main diagonals is the same. Each number can be used only once. What number should we fill in the box below the box with number 2?

6		2

A. 3 B. 4 C. 6 D. 7 E. 9

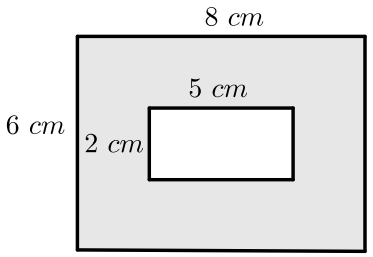
56 How many of the numbers in $\{-2021, -2020, \cdots, 2019, 2020, 2021\}$ are perfect squares? (0 is also a perfect square)

A. 44 B. 45 C. 88 D. 89 E. 90

57 If $\dfrac{1}{1+\frac{1}{x}} = 2$, the result of $\dfrac{1}{1+\frac{1}{1+\frac{1}{x}}}$ is equal to:

A. $\dfrac{3}{2}$ B. $\dfrac{1}{3}$ C. $\dfrac{2}{3}$ D. 4 E. $\dfrac{1}{2}$

58 As shown in the figure, a small rectangle is contained inside a large rectangle. Then the area of the shadow is _____ cm^2.



A. 10 B. 30 C. 40 D. 38 E. 48

59 Calculate: $2020 \div [20 \times 20 + (20 + 20) \div 10] =$ _____

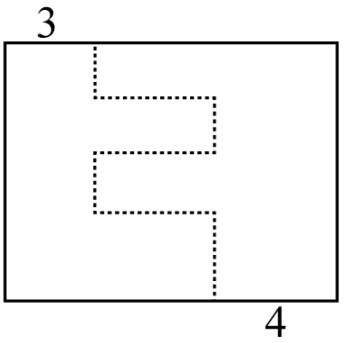
A. 4 B. 5 C. 10 D. 12 E. 20

60 The statistical table that shows the numbers of machines produced by the UFO factory in a week is broken, as shown in the figure. Several digits are missing in the table. According to this statistical table, the production on Wednesday is _____ .

Week	Mon	Tues	Wed	Thur	Fri	Mean
Quantity	81	74	6	7	69	73

A. 61 B. 64 C. 66 D. 67 E. 68

61 As shown in the picture, there is a rectangular piece of paper with 12 cm in length and 10 cm in width. Cut the piece of paper into two parts along the dotted line. The sum of the perimeter of the two parts is _____ cm.



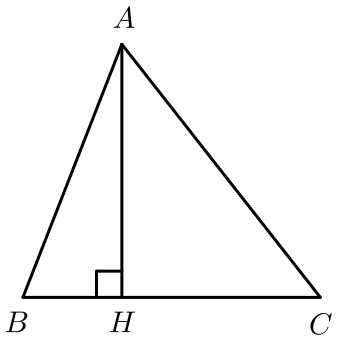
A. 90 cm B. 94 cm C. 96 cm D. 98 cm E. 100 cm

62 If $A = 1 - 3 + 5 - 7 + 9 - 11 + \cdots + 2017 - 2019 + 2021$, and $B = 1 + 3 + 5 + 7 + 9 + 11 + \cdots + 2017 + 2019 + 2021$, then the value of $\frac{A}{B}$ is _____

A. $\frac{1011}{1010 \times 1012}$ B. $\frac{1}{1010}$ C. $\frac{1}{1011}$ D. $\frac{1}{2021}$

E. $\frac{2021}{1011^2}$

63 As shown in the figure below, in triangle ABC, AH is the corresponding height on side BC. If $AB = 11$, $BH = 4$, and $AC = 13$, then $CH =$ _____ .



A. 6 B. 7 C. 8 D. 9 E. 10

64 Vicky had some money in her pocket. First, she spent 5 dollars more than half of the money. Then, she spent 2 dollars more than half of the remaining money. In the end, Vicky had 6 dollars left. Originally, Vicky had _____ dollars.

A. 29 B. 42 C. 31 D. 6 E. 48

NOTE

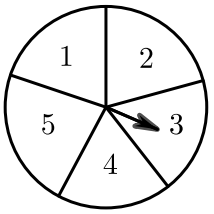
Think One on One

1. In the arithmetic sequence $2, 5, 8, 11, \cdots$, the 14th term is _____ .

2. In Think City, women take up 49% of all people. There is a total of $25,000$ people in Think City. There are _____ men in Think City.

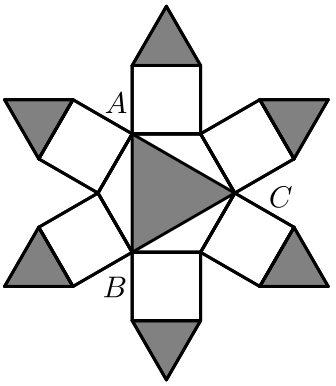
3. The remainder of $128 \div 14$ is _____ .

4 As shown in the figure, the turntable is divided into five equal sectors. They are numbered with 1, 2, 3, 4, and 5, respectively. When the turntable stops after free spinning, the probability of the pointer pointing at an even number sector is _____ .



5 Ken has a 64 cm long rope and he wants to use the rope to frame a rectangle with no remainder. If the length and the width of the rectangle are both whole numbers, the largest possible area of the rectangle that Ken can make is _____ cm^2.

6 As the figure shown, the area of triangle ABC is 15 cm^2. The figure consists of 6 small equilateral triangles, 6 squares and 1 regular hexagon with a large equilateral triangle inside. The sum of the area of 6 outer small equilateral triangles is _____ cm^2.



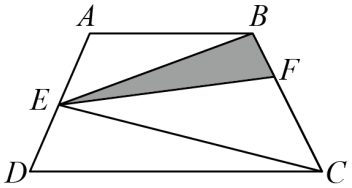
7 $5\frac{1}{3} - 5\frac{2}{7} + 2\frac{2}{3} =$ _____ .

8 John is 28 years younger than his father and John's father is 5 times as old as John. This year, the age of John is _____ years old.

9 $720,000 \div 10^3 =$ _____ .

10 Fill a digit in the square so that the number $\overline{235\square}$ is divisible by 3. There are _____ possibilities to fill in the number.

11 As shown below, the area of trapezoid $ABCD$ is 240, E is the midpoint of AD, $BC = 3BF$. Then, the area of the shaded region is _____ .



12 An elephant ate 28 watermelons on the first day. The number of watermelons it ate on the second day is $\frac{2}{7}$ larger than the number of watermelons it ate on the first day. The number of watermelons it ate on the third day is $\frac{1}{6}$ smaller than the number of watermelons it ate on the second day. The elephant ate a total of _____ watermelons in these three days.

13 The number which only has two factors (1 and itself) is called prime number. Counting from 1 to 20, there are _____ prime numbers in total.

14 Irene bought a story book. To finish the book, she read 10 pages per day for the first three days and 20 pages per day for the following seven days. Irene read _____ pages per day on average.

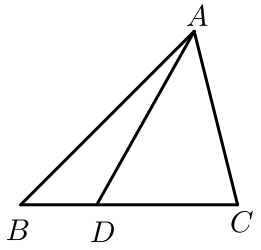
15 The teacher distributes some notebooks, which could be equally distributed among 3, 4, 6, 7 or 9 students with no surplus. There are at least _____ notebooks.

16 City A is 720 km away from City B. Cindy drives a car from City A to City B and it takes her 8 hours. Cindy takes another 6 hours to drive from City B to City C at the same speed. The distance between City B and City C is _____ km.

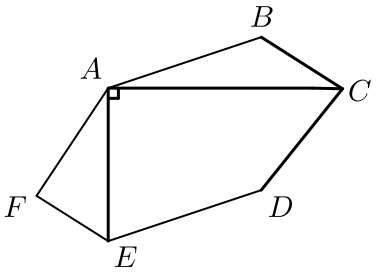
17 If today is Monday, it will be _____ after 15 days.

18 A total of 3 chickens and rabbits are caged together. If there are 10 legs in total, there should be _____ rabbits inside the cage.

19 The area of triangle ABD is 25. Given that $DC = 2BD$, the area of triangle ABC is _____ .



20 As shown below, in hexagon $ABCDEF$, $AB = ED$, $BC = FE$, $AF = CD$. $AB//ED$, $BC//FE$, $AF//CD$, $AC \perp AE$. Given that $AC = 18$ cm, $AE = 9$ cm, the area of hexagon $ABCDEF$ is _____ cm^2.

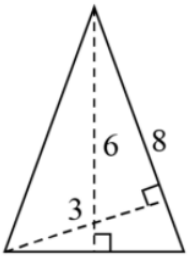


21 Calculate: $1.7 + 5 + 0.5 + 1.3 =$ _____ .

22 The least common multiple of 35 and 15 is _____ .

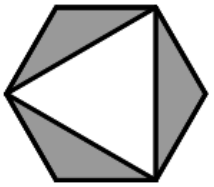
23 Seven students (including Jasmine and Jason) are lining up to take a picture. If Jasmine has to stand on the left end, and Jason must be next to Jasmine, in _____ ways can the seven students line up.

24 The area of the triangle is _____ .

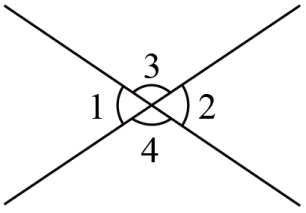


25 $59 \times 3 =$ _____

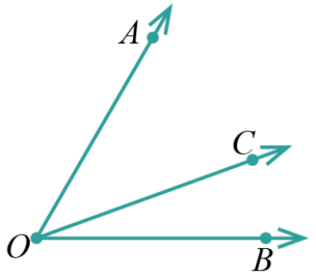
26 In the regular hexagon as shown below, the shaded area is 144. The area of the regular hexagon is _____ .



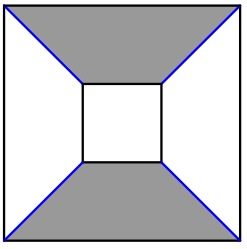
27 Two straight lines intersect and four angles are formed as shown. If $\angle 1 = 68^\circ$, the sum of $\angle 3$ and $\angle 4$ is _____ $^\circ$.



28 $\angle COB = 20^\circ$. The measure of $\angle AOC$ is twice the measure of $\angle COB$. $\angle AOB =$ _____ $^\circ$



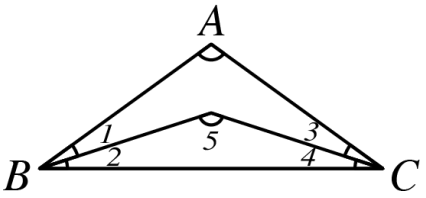
29 In the picture below, the big square has a side length of 9, and the small square has a side length of 3. The sum of the areas of the trapezoids (shaded) is _____ .



30 Bowen chose a number, subtracted 7, added 2, divided the result by 5, multiplied the result by 3, and the final answer was 3. This number was _____ .

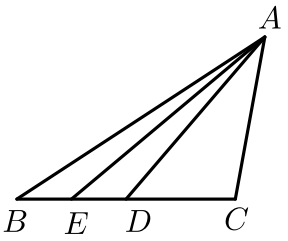
31 The largest three-digit number that can be divisible by all of 4, 9, and 5 is _____ .

32 In $\triangle ABC$, $\angle 1 = \angle 2 = \angle 3 = \angle 4$, $\angle 5 = 8\angle 2$, then $\angle A =$ _____ °.



33 In the figure below, $S_{\triangle ABE} = \frac{1}{5}S_{\triangle ABC}$, $S_{\triangle ABD} = \frac{1}{2}S_{\triangle ABC}$. $BC = 30$.

$ED =$ _____ .



34 Given an arithmetic sequence: $3, 6, 9, 12, \cdots$, then the 8th term of this sequence is _____ .

35 There are five numbers: $25, 26, 34, 42$, and 78.
The average of them is _____ .

36 Selena likes collecting coins. She collected 3 coins in the first week, 7 in the second week, 11 in the third week and 15 in the fourth week. According to this pattern, she has collected a total of _____ coins during the first ten weeks.

37 $929 \div 3 = 309R$ _____

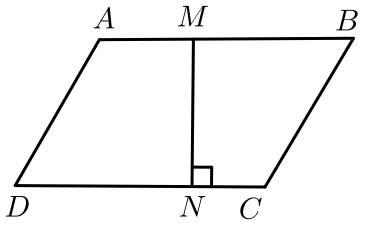
38 $\frac{5}{3} + \frac{7}{6} - \frac{4}{3} - \frac{5}{6} =$ _____ .

39 Boat A travels downstream from a harbor at a speed of 30 km/h. 3 hours later, boat B starts from the same harbor to chase boat A. If it takes boat B 6 h to catch up with boat A, boat B travels downstream at a speed of _____ km/h.

40 Among these numbers: 324412, 2316, 5042, 234 and 19804, _____ of them is/are multiple(s) of 4.

41 $3x - 8 = x$, $x =$ _____ .

42 In parallelogram $ABCD$, MN is the height of this parallelogram with a length of 5 cm, and DC is the base of this parallelogram with a length of 10 cm. Thus, the area of the parallelogram is _____ cm^2.



43 There is a total of 36 pears and oranges in a basket. The number of oranges is $\frac{1}{4}$ of the total. There are _____ pears in the basket.

44 The greatest common factor of 12 and 18 is _____ .

45 Minna had some money in her pocket. First, she spent half of the money. Then, she spent 5 dollars less than half of the remaining money. In the end, Minna had 110 dollars left. Originally, Minna had _____ dollars.

46 City A is 1000 km away from City B. Justin drives a car from City A to City B and it takes him 8 hours. Justin takes another 5 hours to drive from City B to City C at the same speed. The distance between City B and City C is _____ km.

47 $10 \times 13 + 87 \times 10 =$ _____ .

48 Mrs. Lee wants to choose one boy and one girl from Group 1 to join the Think Olympics. If there are four girls and five boys in Group 1, then Mrs. Lee will have _____ different choices to choose from in total.

49 There are 150 boys and 90 girls attending a Math competition. Also, there are 100 girls and 80 boys attending an English language competition. 60 boys attend both competitions. Given that a total of 280 students attend the Math competiton or the English language competition or both, the number of girls who only attend the Math competition is _____ .

50 Fill in each □ with the appropriate digit and the quotient of the division is _____ .

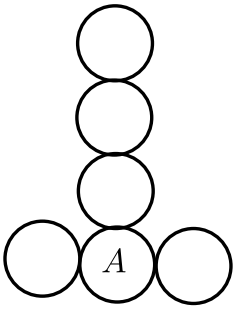
```
                0
8 ) ____________
    4   8
    ____________
            1

            ________
                0
```

51 Given that March 4, 2020 is Wednesday, what day is October 18, 2020?

52 Fill in each box with a number so that the sum of 3 numbers in each row, column and two main diagonals is the same. Each number cannot be used more than once. A is _____ .

A		
	5	
4	9	

53 Fill each of the 6 numbers among $6 \sim 11$ in each circle so that the sum of numbers in the four circles on the vertical line equals the sum of numbers in the three circles on the horizontal line. $A =$ _____ .



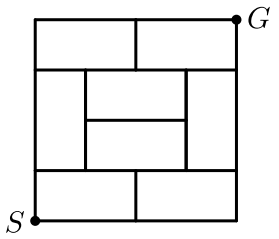
54 Think Electric Power Company has stipulated the following electricity charging methods:
If a user uses less than 100 kilowatt-hours a month, he or she will be charged 0.4 dollars per kilowatt-hour.
If a user uses more than 100 but less than 150 kilowatt-hours a month, the excess part will be charged 0.5 dollars per kilowatt-hour.
If a user uses more than 150 kilowatt-hours a month, the excess part will be charged 0.6 dollars per kilowatt-hour.
If Irene spent 80 dollars for the electricity charge in May, she used _____ kilowatt-hours of electricity in May.

55 On October 1st 2021, Jack bought a magic flower, which needed to be watered at least 9 days per month, otherwise it would die. But Jack is very careless and he only remember to water the flower on each Sunday and Monday. Given that October 1st 2021 is Friday, then the flower will die at the end of _____ . (Fill in a month)

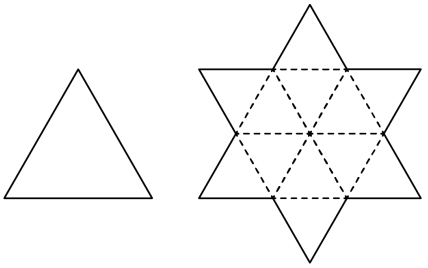
56 A book has n pages, numbered from 1 through n. These n numbers take up 99 digits in total. For example, page 9 takes up 1 digit and page 12 takes up 2 digits. Thus, n is _____ .

57 Irene goes to the library every 6 days. Candy goes to the library every 8 days. Peter goes to the library evey 12 days. On 2nd July, Irene, Candy and Peter meet in the library. The next date they meet together in the library is July _____ .

58 A block is shown below. The segments represent roads and the block is a square with a side length of 400 meters. John is located at point S and he decides to walk to the point G. However, he wants to walk as long as possible but he does not want to walk on the same road twice. The maximum value of the length he can walk is _____ meters.



59 The hexagonal star in the figure consists of 12 identical small triangles. If the perimeter of the hexagonal star is twice that of the equilateral triangle on the left, the area of the hexagonal star is _____ times that of the equilateral triangle on the left.



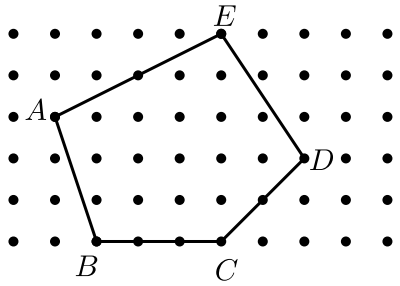
60 There were 480 books in a book shop. $\frac{1}{8}$ of all books were sold on the first day; $\frac{1}{7}$ of the rest were sold on the second day. On the third day, a school bought the rest of the books. The school bought _____ books from the book shop.

61 There were 300 books in a book shop. $\frac{1}{4}$ of all books were sold on the first day; $\frac{1}{5}$ of the rest of books were sold on the second day. On the third day, a school bought the rest of the books. The school bought _____ books from the book shop.

62 Judy bought many pairs of socks with color of red, white and black and put them into a non - transparent bag. She picked each time one sock from the bag randomly without observing it. To make sure that she could get two pairs of socks (only socks of the same color can form a pair), she should pick at least _____ times.

63 Starting with some gold coins and some empty treasure chests, Michael tries to put 8 gold coins in each treasure chest, but that leaves 3 treasure chests empty. So instead Michael puts 5 gold coins in each treasure chest, but Michael still needs 3 gold coins. Michael has _____ gold coins in total.

64 On the geoboard below, the distance between each two adjacent dots is 1. The area enclosed by the polygon below is _____ .



65 A train passes through the Golden Gate Bridge and its length is 2780 meters. A train runs 1000 meters per minute and it takes the train 3 minutes to pass the bridge completely. The length of the train is _____ m.

66 Calculate: $(1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6})\div(\frac{1}{4}+\frac{1}{5}+\frac{1}{6})=$ _____ .

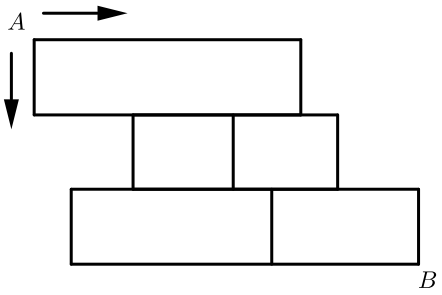
67 Calculate:
$99+103+107+111+115+119+123+127+131=$ _____ .

68 Students go boating. If 3 students share a boat, two more boats will be needed; if 4 students share a boat, there will be one boat left. There are _____ students in total.

69 Mike runs a restaurant and sells 3 kinds of snacks: chips in 4 flavors, fried chicken in 3 flavors, and cookies in 2 flavors. If you can choose two kinds of snacks with each snack in a flavor to make a combo, you can make _____ different combos.

70 On Christmas Day, the community center hosted a special event for seven elderly members. Their ages are seven consecutive natural numbers, and the sum of their ages is 553. What is the age of the eldest member?

71 John wants to go from point A to point B, and each step can only move down or move right. There are _____ different ways for him to arrive at the destination.



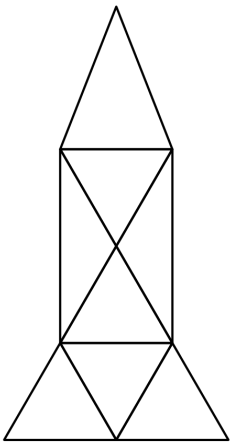
72 The product of four consecutive natural numbers is 7920. Among these four consecutive natural numbers, the largest one is _____ .

73 Continuous natural numbers starting from 1 are arranged in the picture shown below. Now if we use an "X" to cross out five numbers, which of the following can be the sum of these five numbers?

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
		...				...		

A. 186 B. 225 C. 255 D. 230 E. 275

74 There are _____ triangles in the figure below.

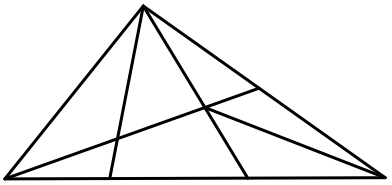


75 Calculate: $\left(1-\frac{1}{2}\right)\times\left(1-\frac{1}{3}\right)\times\left(1-\frac{1}{4}\right)\times\left(1-\frac{1}{5}\right)\times\cdots\times\left(1-\frac{1}{2021}\right)=$

_____

76 Jack and John start driving at the same time in the place towards the same direction. Jack drives at a constant speed of 60 km/h. John drives at 30 km/h for the first hour, 40 km/h for the second hour, 50 km/h for the third hour, and so on, increasing his speed by 10 km every hour. _____ hours later, John will catch up with Jack.

77 There are _____ triangles in the figure below.



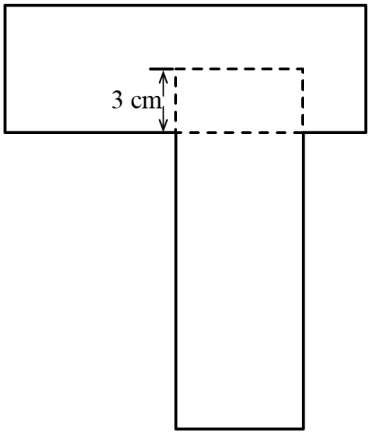
78 When the age of Jack was the same as his younger brother's current age, his younger brother was 8 years old. When his younger brother becomes the same age as Jack's current age, Jack will be 41 years old. Jack is _____ years old this year.

79 Calculate:

$2 - 1.99 + 1.98 - 1.97 + 1.96 - 1.95 + \cdots + 0.02 - 0.01 =$ _____

80 There are _____ positive integer factors of 4040 that have more than 3 factors. (For example, 12 has 6 factors, namely 1, 2, 3, 4, 6, and 12.)

81 The figure below can be regrarded as two identical rectangles partially overlapping each other. The area of each rectangle is $128\ \text{cm}^2$. The length of each rectangle is twice its width. The perimeter of the figure is _____ cm.



82 At Think Olympics, Superman Michael completes a $1000-$meter race. He runs the first 320 meters at a speed of $5\frac{1}{3}$ meters per second, the middle 260 meters at a speed of $\frac{13}{3}$ meters per second, and in the sprint stage, Michael runs at a speed of 10.5 meters per second. Michael spends _____ s to complete the race.

83 A total of 72 chickens and rabbits are caged together. Peter counts the number of legs of rabbits is six times that of legs of chickens. Thus, there are _____ rabbits in the cage.

84 Calculate:

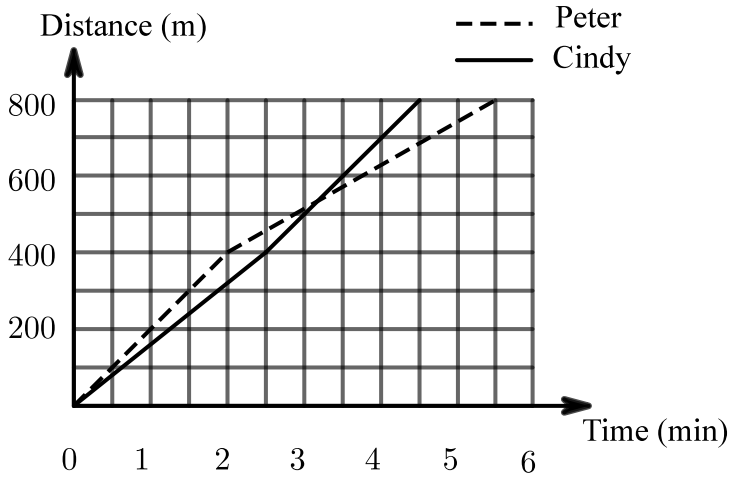
$1198 \div 567 + 3852 \div 567 + 620 \div 567 =$ _____ .

NOTE

NOTE

Think Cup

1. Peter and Cindy have an 800 m race. The graph below shows the distance they run and the time spent from the start of the race. Which of the following statements is wrong?



A. Cindy wins the race.
B. Cindy's fastest speed in the entire race is 200 m/min.
C. They meet when running for 3 min.
D. Peter's fastest speed in the entire race is 160 m/min.
E. When running for 2 min, Peter takes the lead.

2. 5 cents equal 0.05 dollars. How many dollars are 500 cents?
A. 0.5 B. 5 C. 50 D. 500 E. 5000

3 Candy defines a new operation: $a * b = ab - b$. Given that $x * 5 = 30$, x is equal to _____ .

A. 2 B. $\frac{11}{5}$ C. 7 D. 9 E. 6

4 Betty's favorite sport is swimming. After swimming in the summer holiday, her height increases by $\frac{1}{25}$. Betty's original height is _____ shorter than her height now.

A. $\frac{2}{25}$ B. $\frac{1}{24}$ C. $\frac{24}{25}$ D. $\frac{1}{25}$ E. $\frac{1}{26}$

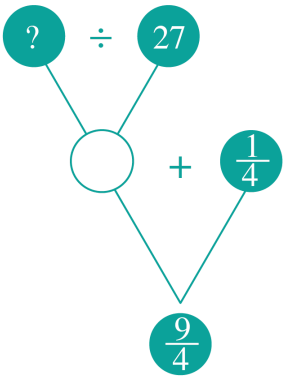
5 Pick a number from $1 \sim 2022$ and multiply it by 72. What is the probability of getting a perfect square as a result?

A. $\frac{22}{1011}$ B. $\frac{10}{674}$ C. $\frac{45}{2022}$ D. $\frac{2}{337}$ E. $\frac{31}{2022}$

6 The weights of 2 basketball players are 75 kg and 87.5 kg, respectively. The weight of the 3rd player is between the weights of these 2 players. Which of the following weights cannot be the average weight of these 3 basketball players?

A. 80.5 kg
B. 81.5 kg
C. 82.5 kg
D. 72.5 kg
E. It cannot be determined.

7 According to the figure below, find the value of ? on the top circle.



A. 27 B. 108 C. 135 D. 81 E. 54

8 Mike defines a new operation: Given that $a\&b = a + b \div 10$, what is the value of $7\&5$?

A. 1.2 B. 5.7 C. 7.5 D. 12 E. 35

9 There are seven consecutive even numbers that the largest one is twice as large as the smallest one. What is the sum of these seven consecutive even numbers?

A. 120 B. 122 C. 124 D. 126 E. 130

10 When decorating Lyra's room with pink ribbons, she wants to measure the circumference of a pillar in her room with two identical ribbons.
For the first measurement, she folds a ribbon once as picture ① and glues it to form a new ribbon. The new ribbon can wrap around the pillar for 2 laps with a surplus of 1 m.
For the second measurement, she folds the other ribbon twice as picture ② and glues it to form a new ribbon. The new ribbon can wrap around the pillar for 1 lap with a surplus of 1.5 m.
What is the circumference of the pillar?

A. 0.5 m B. 2.5 m C. 3 m D. 3.5 m E. 4.5 m

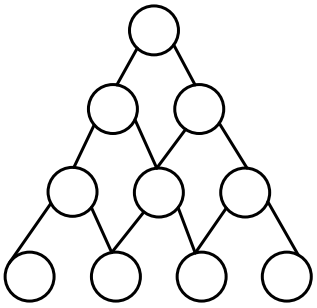
11 Before Jason went out for a walk, he looked at his watch, and when he came back home, he found that the hour hand and the minute hand exactly switched their positions. Given that Jason spent less than an hour on the walk, he went out for around _____ minutes.

A. 59 B. 55 C. 48 D. 28 E. 50

12 Fifi and Kiki have two identical ropes. Fifi first cuts off $\frac{1}{3}$ of his rope, and then cuts $\frac{1}{3}$ meters off the rope. Kiki first cuts $\frac{1}{3}$ meters off his rope, and then cuts off $\frac{1}{3}$ of the remaining rope. Compare the two remaining ropes, _____ .

A. Fifi's remaining rope is longer no matter how long each rope is
B. Kiki's remaining rope is longer no matter how long each rope is
C. their remaining ropes have the same length
D. Kiki's remaining rope is longer only when each rope is smaller than 3 meters
E. it cannot be determined

13 As shown below, fill ten different whole numbers in the ten circles to guarantee the number in each circle is the sum of two numbers in the connected circles below it. What is the minimum of the number in the circle on the top?



A. 10 B. 15 C. 16 D. 18 E. 20

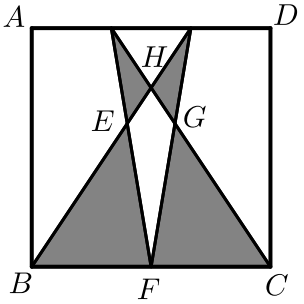
14 There are 2022 students standing in a line signing up for World Think Cup. First, they number off by 3 from the left-hand side (for example, the first student calls out one, the second student calls out two, and the third student calls out three, then the fourth student calls out one again). Then, they number off by 4 from the right-hand side. How many people call out 1 in both rounds?

A. 165 B. 166 C. 167 D. 168 E. 169

15 Cassie goes on an escalator in the shopping mall which runs from the 2nd floor to the ground floor with a constant speed of 1 step per second. Cassie is in a hurry, so she also goes 2 steps per second down on the running escalator. In this case, it takes Cassie 8 seconds to get to the ground floor. On the next day, the staff in the shopping mall changes the speed of escalator to 2 steps per second. If Cassie keeps her original speed, how long will it take Cassie to get to the ground floor this time?

A. 2 seconds B. 4 seconds C. 6 seconds D. 8 seconds
E. 10 seconds

16 As shown below, the side length of square $ABCD$ is 12 cm. The total area of the shaded regions is 60 cm^2. The area of quadrilateral $EFGH$ is _____ cm^2.

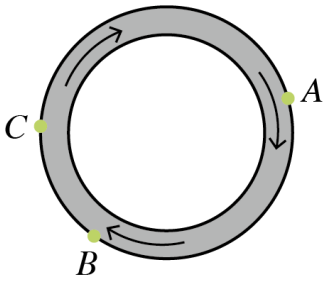


A. 4 B. 6 C. 8 D. 12 E. 24

17 There are 43 wizards in a wizardry class. Each of them chooses either one or two or three kinds of the magic ingredient from bat wool, dried nettles, and unicorn's hair to make magic potion. Each different combination of ingredients makes a unique magic potion. At least _____ wizards make the same magic potion which is made by the most wizards.

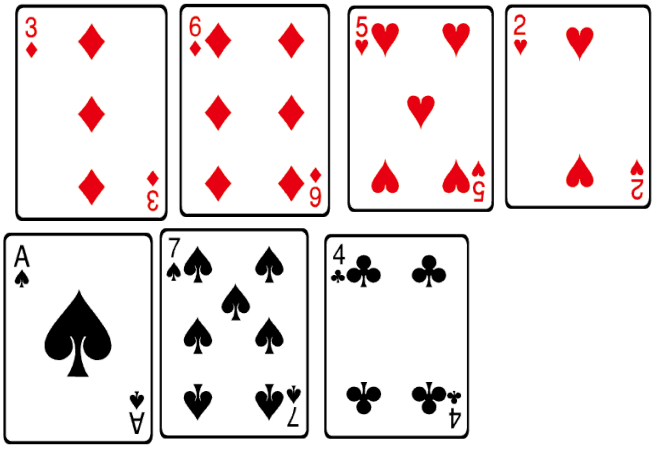
A. 5 B. 6 C. 7 D. 8 E. 9

18 Peter, Nini, and Mike stand in different points A, B, and C on the circular track, respectively. They can only run along the road clockwise. Peter runs 200 m to reach C, Nini runs 300 m to reach A, and Mike runs 350 m to reach B. Thus, Peter runs _____ m to reach B.



A. 105 B. 125 C. 145 D. 165 E. 300

19 There are 7 poker cards in a pocket as shown below. Valeria randomly picks one card from the pocket. Which suit is the least likely to be picked?



A. ♠ B. ♥

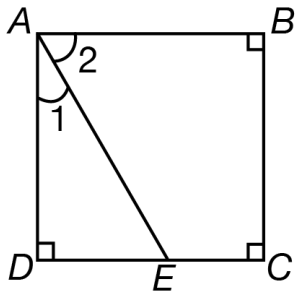
C. ♦ D. ♣

E. It cannot be determined.

20 When calculating $1.3 + \square \times 9$, Johnny firstly calculated the addition and obtained 18 as the result. What is the correct answer?

A. 8.4 B. 3.6 C. 1.8 D. 7.6 E. 6.3

21 In square $ABCD$, if the measure of $\angle 2$ is twice that of $\angle 1$, then $m\angle 2 =$ _____ °.



A. 45 B. 50 C. 55 D. 60 E. 80

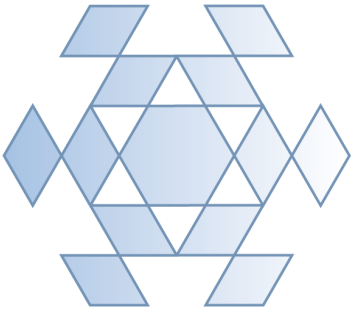
22 Bryan bought $\frac{7}{9}$ pounds of beef and $\frac{3}{4}$ pounds of chicken in the supermarket. What is the total amount of the meat Bryan bought in pound?

A. $\frac{19}{36}$ B. $1\frac{19}{36}$ C. $1\frac{9}{36}$ D. $2\frac{2}{3}$ E. $\frac{55}{72}$

23 Add 3 digits behind 2018 to make the new number divisible by 2, 3, 5, and 11. The largest possible value of the new number is _____ .

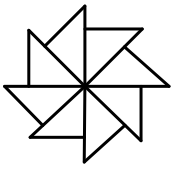
A. 2018220 B. 2018970 C. 2018940 D. 2018980 E. 2018610

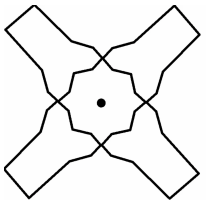
24 Doctor James found a complete snowflake and observed it under the microscope. As shown below, the snowflake is symmetric with a regular hexagon in the center and 12 identical diamonds. The regular hexagon has an area of 12 mm^2. The total area of this snowflake is _____ mm^2.

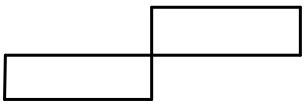


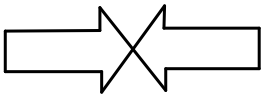
A. 24 mm^2 B. 36 mm^2 C. 48 mm^2 D. 60 mm^2 E. 120 mm^2

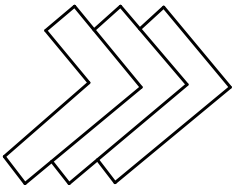
25 Which of the following figures cannot be obtained by rotation?

A. 

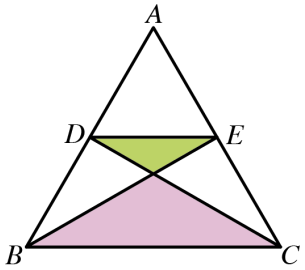
B. 

C. 

D. 

E. 

26 The graphic design of a park is shown below. The park is in the shape of a triangle. D and E are the midpoints of AB and AC, respectively. The pink area is designed to be a flower bed, and the green area is designed to be a grassland. Given that the area of the flower bed is supposed to be 505.5 m^2 larger than that of the grassland, the area of the entire park is _____ m^2.



A. 505.5
B. 2022
C. 1011
D. 820
E. It cannot be determined.

27 Among all three-digit numbers, there are _____ numbers including at least one digit 7.

A. 250 B. 251 C. 252 D. 260 E. 261

28 Ron's grandpa says: "I will plant some vegetables on my farm with an area of 800 m^2. I love tomatoes, so I will plant tomatoes on $\frac{3}{5}$ of my farmland."

Ron says: "I love celery and spinach. Could you plant celery and spinach on the remaining farmland with an area ratio of 3 : 1?"

Ron's grandpa says: "Of course! Then the area of farmland with celery is _____ m^2."

A. 480 B. 400 C. 320 D. 240 E. 80

29 Divide the following 8 balls into two groups with 4 balls in each group so that the product of four results on balls in each group is the same. Which of the followings shows a correct group of balls?

$2^3 \times 5$ $3 \times 5 \times 7$ $2^2 \times 11$ $3^2 \times 5$ $3^2 \times 11$ $3^2 \times 7$ 5×13 $2 \times 3 \times 13$

A. $3^2 \times 5$ $2 \times 3 \times 13$ $3 \times 5 \times 7$ $2^2 \times 11$

B. $2^3 \times 5$ $3^2 \times 11$ $3^2 \times 7$ 5×13

C. $3^2 \times 5$ $2^2 \times 11$ $3 \times 5 \times 7$ 5×13

D. $2^3 \times 5$ $3 \times 5 \times 7$ $2^2 \times 11$ $2 \times 3 \times 13$

E. $2^3 \times 5$ $2^2 \times 11$ $3^2 \times 7$ $2 \times 3 \times 13$

30 There are 10 participants in Think Swimming Competition, and they are numbered from 1 to 10. Participants numbered $1 \sim 4$ are in team A, and $5 \sim 10$ are in team B. Irene and her younger sister are among these 10 participants. What is the probability that they are in the same team?

A. $\frac{6}{17}$ B. $\frac{7}{19}$ C. $\frac{7}{15}$ D. $\frac{6}{14}$ E. $\frac{2}{15}$

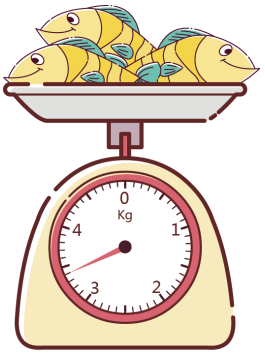
31 Rose buys 5 bottles of milk and spends 13 dollars. If Rose wants to buy 15 more bottles for her friends, she needs to spend _____ dollars.

A. 17 B. 23 C. 26 D. 39 E. 41

32 Ryan plays football every 4 days while John plays football every 6 days. If they both play football today, how many days later will they play football on the same day again?

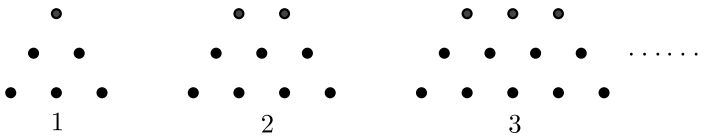
A. 10 B. 12 C. 16 D. 20 E. 24

33 Observe the weight of fish in the figure. If the price of fish is 10.5 dollars per kilogram, how much do the fish cost in total?



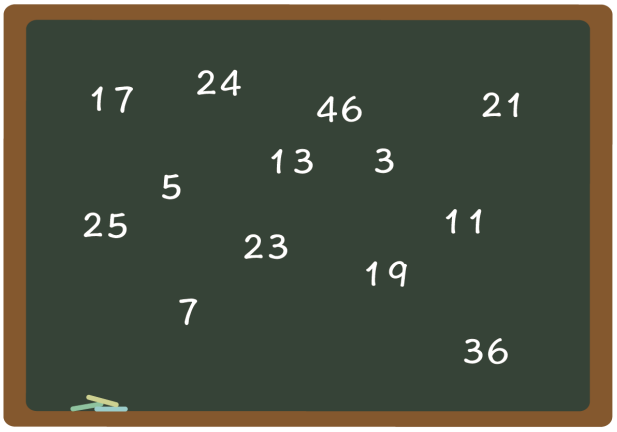
A. 37.5 dollars B. 34.65 dollars C. 36.75 dollars D. 35.7 dollars
E. 33.6 dollars

34 Observe the following figures. According to the pattern in the figures, find how many points there are in the 4th figure?



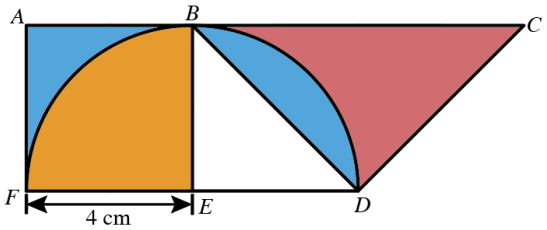
A. 9 B. 18 C. 10 D. 15 E. 13

35 Irene the teacher writes many numbers on the blackboard. Among these numbers, how many of them are prime?



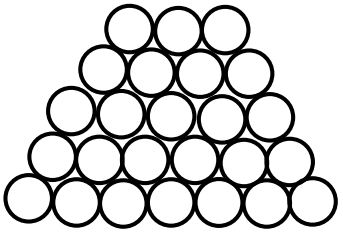
A. 4 B. 6 C. 8 D. 10 E. 12

36 Albert, Bennet, and Catherine are playing a game of comparing the area. In the picture below, there is a semicircle with a radius of 4 cm and an isosceles right triangle BDC. Albert paints with blue, Bennet paints with orange, and Catherine paints with pink. Which of the following rankings is correct, if we order the color with a larger area ahead? ($\pi \approx 3.14$)



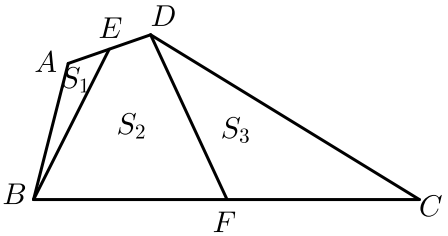
A. Blue > Orange > Pink
B. Orange > Pink > Blue
C. Pink > Orange > Blue
D. Orange > Blue > Pink
E. Blue > Pink > Orange

37 How many circles are there in the figure below?



A. 19 B. 20 C. 24 D. 25 E. 30

38 As shown below, in quadrilateral $ABCD$ which has an area of 60, E and F are the midpoints of AD and BC, respectively. Given that $S_1 = 3$, $S_2 - S_3 =$ _____ .



A. 0 B. 2 C. 3 D. 5 E. 10

39 The greatest common factor of 6^5 and 4^4 is _____ .

A. 12 B. 16 C. 32 D. 64 E. 36

40 Jason, Jennifer, and Julia has a competition to find who writes more words with letter "J". Jason writes 15 words with letter "J", Jennifer writes 8 words, and Julia writes 10 words. Jennifer finds that all her words are also written by Jason. Julia finds that half of her words are also written by Jason, and among these words, 2 are also written by Jennifer. They finally decide to drop the words written by more than one person. Who is the winner?

A. Jason
B. Jennifer
C. Julia
D. Jason and Julia
E. Cannot be determined

41 Cindy and Micheal have some stamps. Cindy's stamps is twice that of Micheal, and they have 36 stamps in total. How many stamps does Cindy have?

A. 30
B. 24
C. 20
D. 18
E. 16

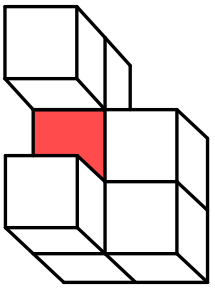
42 Ashley, Daniel, and Wilson are in three different study groups among group A, group B, and group C. Ashley's height is different from that of the one from group C. Wilson is shorter than the one from group A. The one from group C is taller than Daniel. If we rank three students in terms of their heights from tallest to shortest, which of the following rankings is correct?

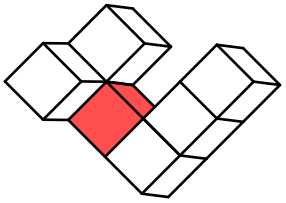
A. Ashley, Daniel, Wilson
B. Wilson, Daniel, Ashley
C. Ashley, Wilson, Daniel
D. Wilson, Ashley, Daniel
E. Cannot be determined

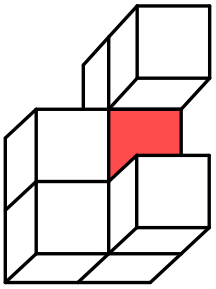
43 △, ◯, and □ each represents a number. If △ + △ + △ = 60, □ × △ = 260, and ◯ ÷ □ = 6, what is the value of ◯?

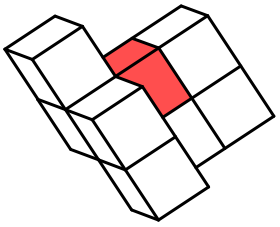
A. 72 B. 120 C. 78 D. 108 E. 56

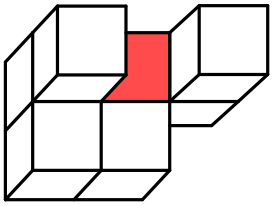
44 Find the figure that can be rotated to coincide with the following one.

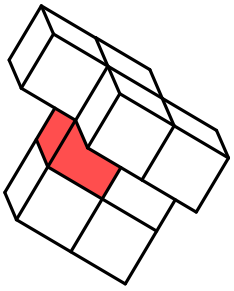


A. 

B. 

C. 

D. 

E. 

45 There are 100 balls with identical size numbered $1 \sim 100$ in an opaque box, and a ball will be randomly picked. Only the balls with a number divisible by 3 are pink, only those with a number divisible by 5 are made of iron, and the others are all black plastic balls. What is the probability that a black plastic ball is picked?

A. $\frac{47}{100}$ B. $\frac{53}{100}$ C. $\frac{12}{25}$ D. $\frac{23}{50}$ E. $\frac{13}{25}$

NOTE