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**Education Bureau**

**Territory-wide System Assessment 2022**

**Secondary 3 Mathematics**

**QUESTION BOOKLET**

CANCELLED

## INSTRUCTIONS

1.  There are 47 questions in this paper.

2.  Time allowed is 65 minutes.

3.  Answer ALL questions in the separate ANSWER BOOKLET.

4.  The use of HKEAA approved calculators is permitted.

5.  Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

6.  Rough work should be done on the rough work sheet provided.

7.  The diagrams in this paper are not necessarily drawn to scale.

# FORMULAS FOR REFERENCE

| | | |
|---|---|---|
| Sector | Arc length | $= 2\pi r \times \dfrac{\theta}{360°}$ |
| | Area | $= \pi r^2 \times \dfrac{\theta}{360°}$ |
| Sphere | Surface area | $= 4\pi r^2$ |
| | Volume | $= \dfrac{4}{3}\pi r^3$ |
| Cylinder | Curved surface area | $= 2\pi rh$ |
| | Volume | $= \pi r^2 h$ |
| Cone | Curved surface area | $= \pi rl$ |
| | Volume | $= \dfrac{1}{3}\pi r^2 h$ |
| Prism | Volume | $=$ base area $\times$ height |
| Pyramid | Volume | $= \dfrac{1}{3} \times$ base area $\times$ height |

SECTION A:    Choose the best answer for each question.
              You should mark all your answers in the ANSWER BOOKLET.

1.    Determine whether to estimate or to compute the exact value in each of the following situations.

      (i)     A cafe recorded the weight of coffee beans used monthly.
      (ii)    A cafe recorded the number of cups of coffee sold in one day.

|     | (i) | (ii) |
| --- | --- | --- |
| A. | To compute the exact value | To compute the exact value |
| B. | To compute the exact value | To estimate |
| C. | To estimate | To compute the exact value |
| D. | To estimate | To estimate |

2.    The number of positive integers less than    $\sqrt{15}$    is

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

3.    The shape of a tabletop is a trapezium.    The ratio of the length of its upper base to that of its lower base is  $1:2$ .    If the length of the upper base is  72 cm , find the length of the lower base.

      A.    36 cm
      B.    48 cm
      C.    144 cm
      D.    216 cm

4. Michael had $x$ face masks. He used 5 of them and gave half of the remainder to Stanley. Find the number of face masks given to Stanley by Michael.

   A. $\dfrac{x-5}{2}$

   B. $\dfrac{x+5}{2}$

   C. $\dfrac{x}{2}-5$

   D. $\dfrac{x}{2}+5$

5. The prices of a pack of rice biscuits and a pack of chocolate biscuits are $15 and $18 respectively. Sally pays at most $120 to buy $x$ packs of rice biscuits and $y$ packs of chocolate biscuits. Which of the following inequalities represent the relationship between $x$ and $y$?

   A. $15x + 18y < 120$

   B. $15x + 18y > 120$

   C. $15x + 18y \geq 120$

   D. $15x + 18y \leq 120$

6. Which of the following statements is correct?

   A. $\dfrac{1}{10}$ is the root of the equation $x + 10 = 0$.

   B. $-\dfrac{1}{20}$ is the root of the equation $x + 20 = 0$.

   C. 30 is the root of the equation $x + 30 = 0$.

   D. $-40$ is the root of the equation $x + 40 = 0$.

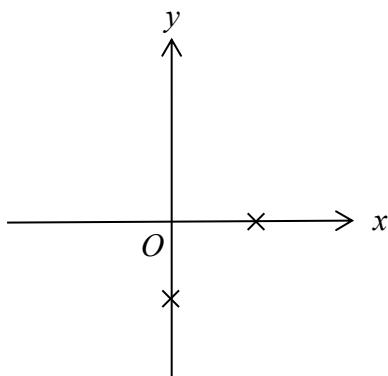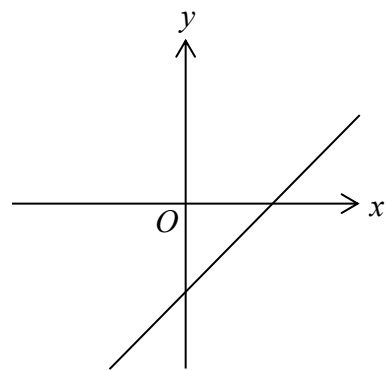7. Which of the following may represent the graph of the equation $x - y - 4 = 0$ ?

A.
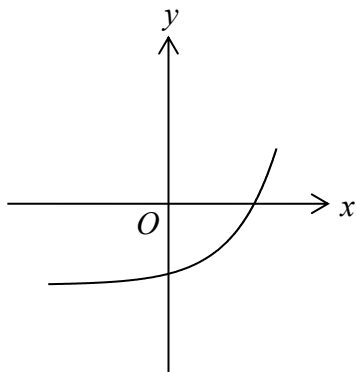


B.
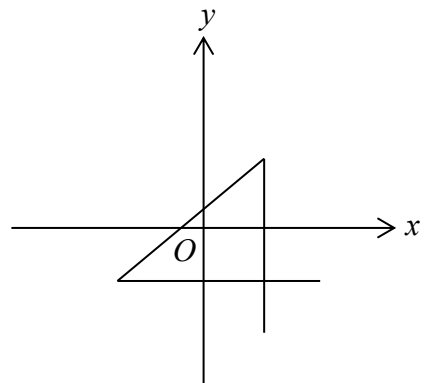


C.



D.



8. The temperature of a cup of tea is $63°C$ (correct to the nearest $°C$). Which of the following could be its actual temperature?
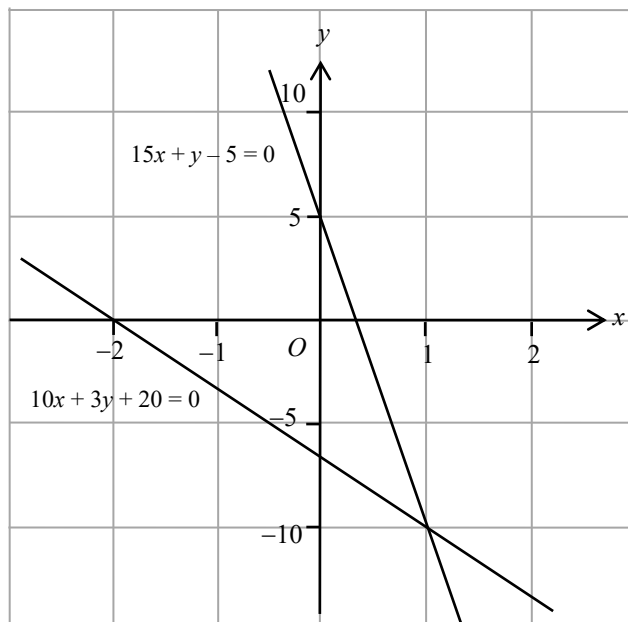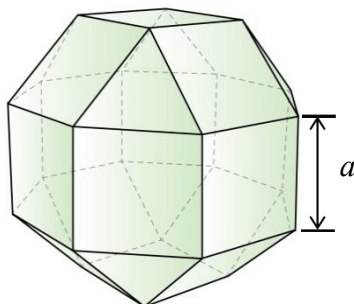
A. 63.6°C

B. 63.5°C

C. 62.5°C

D. 62.4°C

9.



The above figure shows the graphs of $15x + y - 5 = 0$ and $10x + 3y + 20 = 0$.

According to the given graphs, solve the simultaneous equations $\begin{cases} 15x + y - 5 = 0 \\ 10x + 3y + 20 = 0 \end{cases}$ graphically.

A. $(1, -10)$

B. $(-10, 1)$

C. $(-2, 0)$

D. $(0, 5)$

10.



The solid in the figure is a rhombicuboctahedron. Its surfaces consist of $18$ squares and $8$ equilateral triangles. Each of its side lengths is $a$. By considering the **dimensions**, which of the following could be expressed by $\frac{2}{3}(6 + 5\sqrt{2})a^3$?
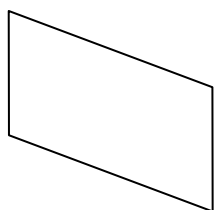
A. Total sum of the lengths of the solid

B. Height of the solid

C. Total surface area of the solid

D. Volume of the solid

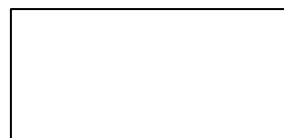11. A cuboid is placed horizontally as shown. It is cut vertically along the line *PQ*.
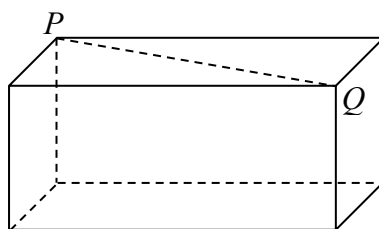


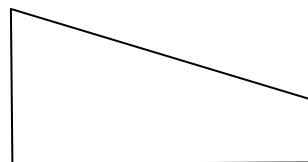Which of the following could express the plane diagram of the cross-section?
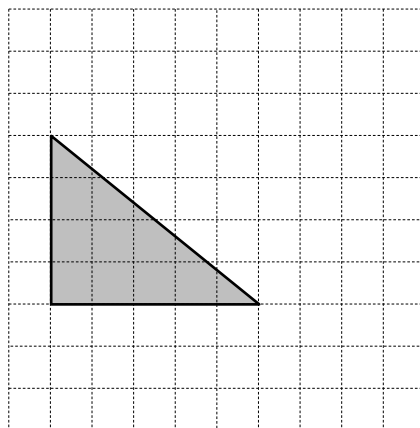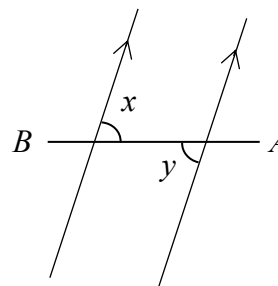
A.



B.



C.



D.



12.



Will the size and shape of the above figure be changed after translation?

| | Size | Shape |
|---|---|---|
| A. | changed | changed |
| B. | unchanged | changed |
| C. | changed | unchanged |
| D. | unchanged | unchanged |

13. In the figure, $AB$ is a straight line. $x$ and $y$ are

    A.    alternate angles.

    B.    vertically opposite angles.

    C.    corresponding angles.

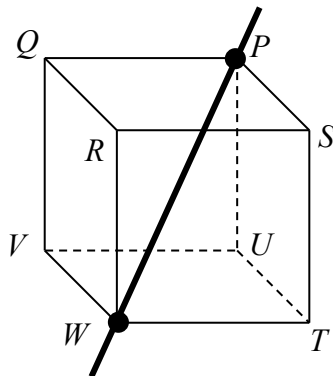    D.    interior angles on the same side.



14. The figure shows a cube $ABCDEFGH$. Which of the following is a plane of reflectional symmetry of the cube?
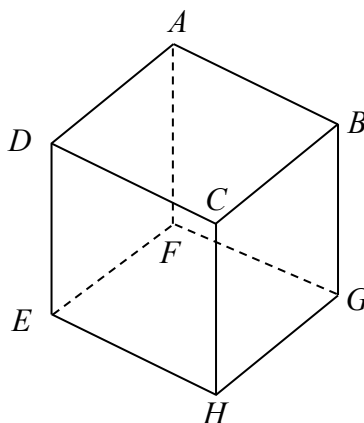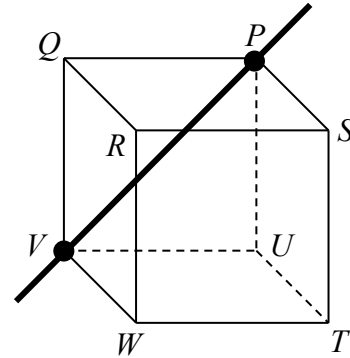


    A.    $EHGF$

    B.    $ECBF$

    C.    $EFAD$

    D.    $EDCH$

15. In the following figures, which thick line is an axis of rotational symmetry of cube $PQRSTUVW$?
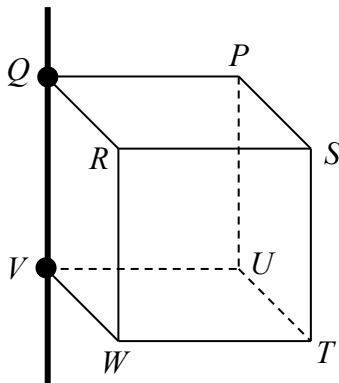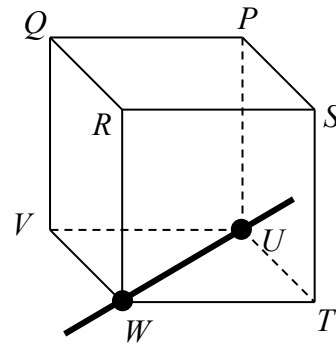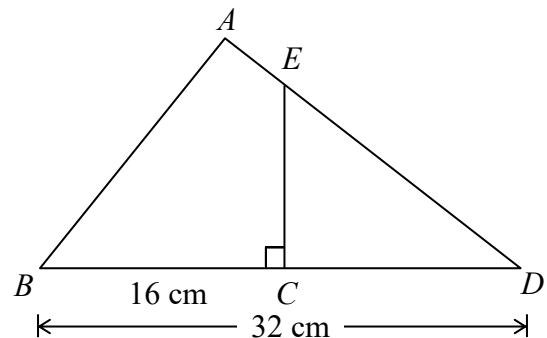
A.

B.

C.

D.

16. In $\triangle ABD$, $BCD$ and $AED$ are straight lines. $EC \perp BD$, $BC = 16$ cm and $BD = 32$ cm.

$EC$ **MUST** be

A. a perpendicular bisector of $\triangle ABD$.

B. an angle bisector of $\triangle ABD$.

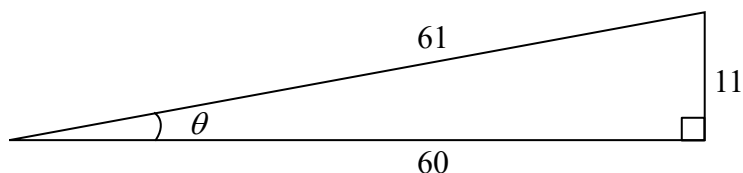C. a median of $\triangle ABD$.

D. an altitude of $\triangle ABD$.

17. $P$ (4, 15) and $Q$ (0, –9) are two points in the rectangular coordinate plane. The coordinates of the mid-point of $PQ$ are

A. (4, 6) .

B. (4, 24) .

C. (2, 3) .

D. (2, 12) .

18. Find the value of $\sin \theta$ in the figure.

A. $\dfrac{11}{60}$

B. $\dfrac{11}{61}$

C. $\dfrac{61}{11}$

D. $\dfrac{60}{61}$



19. The following table shows the number of books read by Sarah last week.

| Day of the Week | Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|---|
| Frequency | 1 | 5 | 3 | 2 | 4 | 8 | 9 |

Which of the following is the most suitable for presenting the data above?

A. Stem-and-leaf diagram

B. Bar chart

C. Cumulative frequency curve

D. Scatter diagram

20. The cumulative frequency curve below shows the monthly salary of 40 interviewees.

**Monthly salary of 40 interviewees**
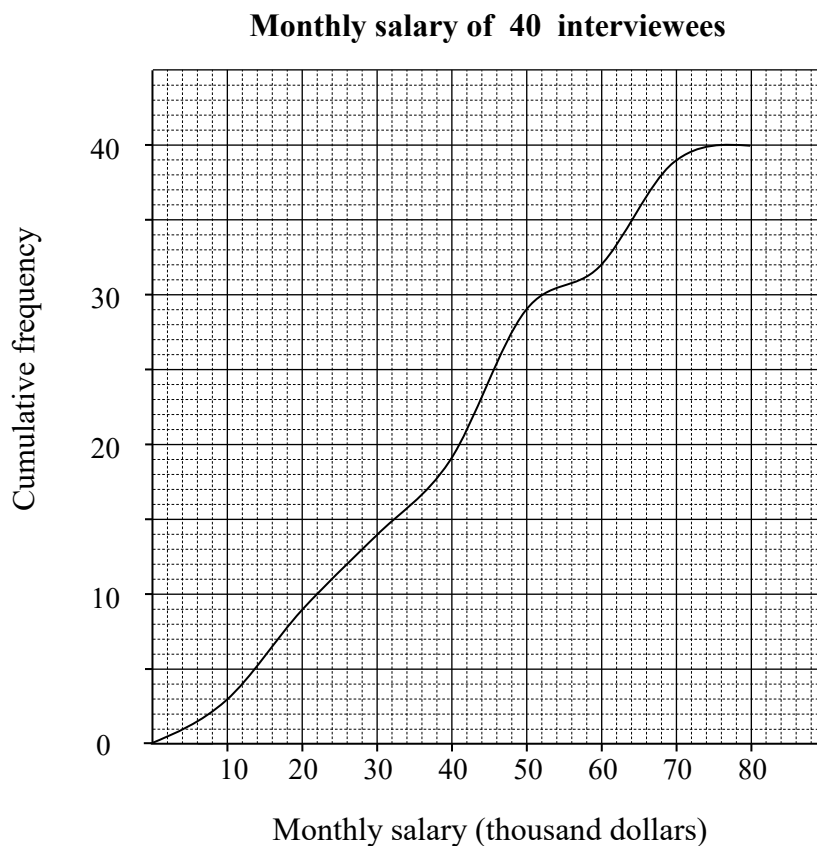


Find the upper quartile of the monthly salary of the 40 interviewees.

A. $60 000

B. $52 000

C. $22 000

D. $20 000

SECTION B:     Write ALL the answers in the ANSWER BOOKLET.
               Working need not be shown.

21.  Calculate  $-4 \times 2 - 1$.

22.  The volume of Jupiter is the greatest in the Solar System.    Its equatorial diameter is about
     143 000 km.    Use scientific notation to represent the diameter.

23.  The  $n^{th}$  term of a sequence is  $1 - 3n$.    Find the value of the  $4^{th}$  term of the sequence.

24.  Find the values of  $x$  and  $y$  in the following sequence of square numbers.

$$1, \quad 4, \quad 9, \quad 16, \quad 25, \quad 36, \quad x, \quad y, \ldots$$
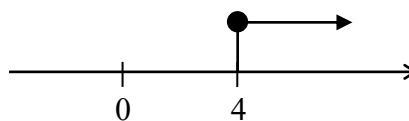
25.  Expand  $x^2(x - x^2)$.

26.  Factorize  $(x - 5) + x(x - 5)$.

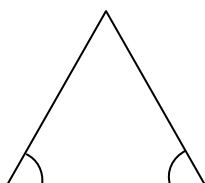27.  Expand   $(1 - 2x)(1 + 2x)$.

28.  Consider the formula  $c = a^2 - b^2$ .    If  $a = 8$  and  $b = -5$ , find the value of  $c$ .

29. According to the diagram, write down an inequality in $x$.
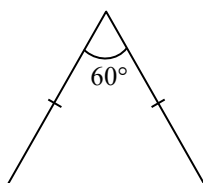
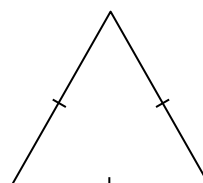30. Which of the following polygons **MUST** be regular?  (May be more than one answer)
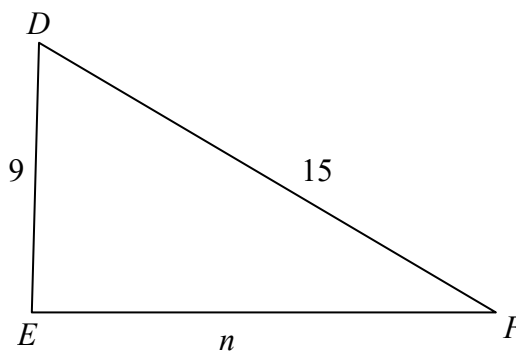
P.

Q.

R.

31. In the figure, $\triangle ABC \sim \triangle DEF$.  Find
    (a)  the value of $m$,
    (b)  the value of $n$.
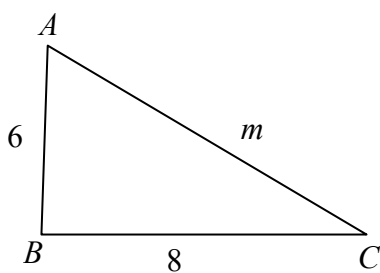
32. In the figure, *ABC* and *DEF* are parallel lines. $\angle ABG = 134°$ and $\angle DEG = 125°$. Find $x$.

A                 D

134°       125°  E

B

G

x

C                 F
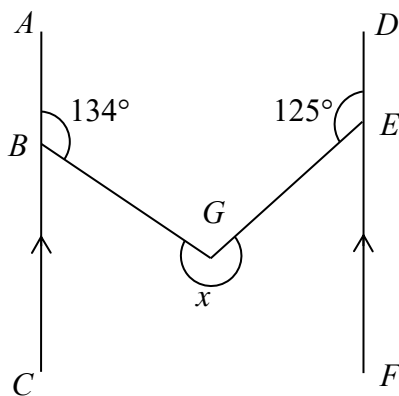
33. In the figure, $S(2, -3)$ is reflected about *x*-axis to $S'$. Find the coordinates of $S'$.
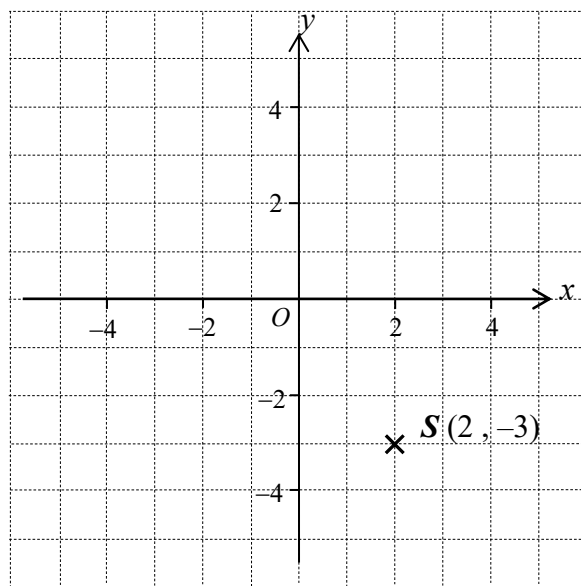
34. Find the distance between two points $A(14, 0)$ and $B(2, -9)$ in the rectangular coordinate plane.

35. In the figure, tan $\theta = 1.62$. Find $\theta$. (Correct to 3 significant figures)



36. The following data show the number of passengers taking the first bus at the terminus of a bus route of 20 working days in the last month.
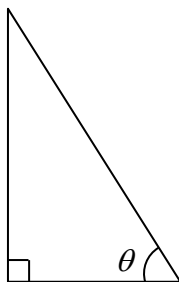
| | | | | |
|---|---|---|---|---|
| 46 | 25 | 30 | 32 | 18 |
| 23 | 35 | 49 | 51 | 38 |
| 69 | 16 | 52 | 14 | 11 |
| 32 | 44 | 48 | 15 | 59 |

Use the data to complete the two frequency distribution tables in the **ANSWER BOOKLET**.

37. The stem-and-leaf diagram below shows the number of pages of each book in Emily's home.

**Number of pages of each book in Emily's home**

| Stem (10 pages) | Leaf (1 page) |
|---|---|
| 13 | 0   5   7 |
| 14 | 0   0   4   8   9 |
| 15 | 0   3   3   6   6   8 |
| 16 | 1   3   7   9 |
| 17 | 5   8 |

According to the above stem-and-leaf diagram, answer the following questions.

(a) How many books are there in Emily's home?

(b) How many pages are there in the book with the most pages in Emily's home?

(c) Find the median of the number of pages of Emily's books at home.

38. Wincy joined a singing contest.　The following table shows the weight of each marking item and her marks in these items.

| | Marking item | | |
| --- | --- | --- | --- |
| | Rhythm | Pitch Accuracy | Performance |
| Mark | 70 | 85 | 60 |
| Weight | 30% | 50% | 20% |

Find the weighted mean mark of Wincy.

39. Ryan used a music player to play 50 songs randomly.　Below shows the frequencies and types of song played.

| Type of Song | Pop Music | Nursery Rhyme | Symphony | Cantonese Opera |
| --- | --- | --- | --- | --- |
| Frequency | 25 | 3 | 20 | 2 |

Find the empirical probability that a symphony is played by the music player.

SECTION C:  All working must be clearly shown.
Write the mathematical expressions, answers and statements/conclusions in the spaces provided in the ANSWER BOOKLET.

40.  Brian deposits $3 500 in a bank.  The **simple interest rate** is 5% p.a.  How long will it take Brian to receive an interest of $700?

41.  The medical expense of Mr Chan is $30 000 this year.  If his medical expense increases by 10% per year, find his medical expense after two years.

42.  (a) Simplify $(x^6)^2$ and express the answer with positive index.

(b) Simplify $\dfrac{(x^6)^2}{x^{-4}}$ and express the answer with positive index.

43.  Complete the table for the equation $x + y - 1 = 0$ in the **ANSWER BOOKLET**.

| $x$ | $-3$ | $0$ | $3$ |
|-----|------|-----|-----|
| $y$ |      | $1$ |     |

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the **ANSWER BOOKLET**.
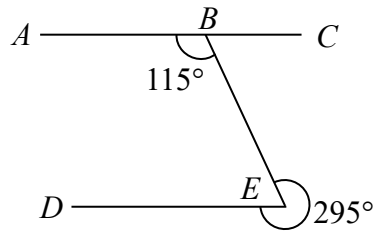
44. The figure shows a loft bed with a ladder.   The distance between two of the steps of the ladder is 0.3 m.   Estimate the height of the loft bed and explain your estimation method.

? m

0.3 m
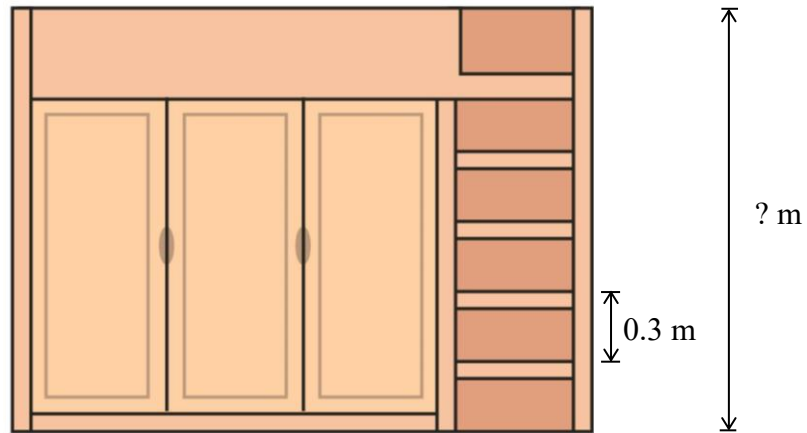
45. In $\triangle ABD$, $BCD$ is a straight line. $\angle ABC = 65°$, $\angle BAC = 50°$ and $\angle ADC = 35°$.   Find $x$.

A

50° $x$

65°

B

35°

C

D
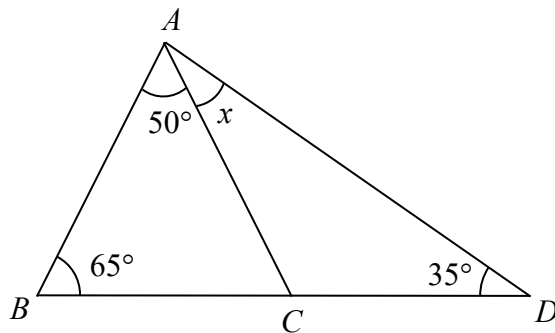
46. In the figure, $ABC$ is a straight line. $\angle ABE = 115°$ and reflex $\angle BED = 295°$.
Prove that $AC \parallel DE$.



47. The table below shows the results of 30 students in a Mathematics test.

| Result (Mark) | 1 – 25 | 26 – 50 | 51 – 75 | 76 – 100 |
|---|---|---|---|---|
| Frequency | 3 | 9 | 12 | 6 |

(a) According to the above table, complete the frequency distribution table in the **ANSWER BOOKLET**.

(b) Find the mean of the Mathematics test result of the 30 students.

## END OF PAPER

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