

Instructions:

You must show ALL the work required in ALL questions. Use only the space provided for each question. Read the statements of the questions very carefully. You will be graded on your methods, not just your answers.

You need a pencil, an eraser, a reliable compass, and a straightedge for this exam. Any use of rulers, protractors, and calculators is prohibited during the exam.

You will have EXACTLY 50 minutes for the exam, which consists of problems numbered 1 – 14. Request a new copy of the exam if any of the problems are missing or hard to read.

1) (9 points) State whether each statement is always true (T) or not always true (F).

- | | | |
|--|----------------------------------|----------------------------------|
| a) A parallelogram is a rhombus. | T | <input checked="" type="radio"/> |
| b) A triangle can have at most one right angle. | <input checked="" type="radio"/> | F |
| c) A rhombus is a kite. | <input checked="" type="radio"/> | F |
| d) If two distinct circles in the plane intersect, they intersect at two points. | T | <input checked="" type="radio"/> |
| e) An acute triangle is a scalene triangle. | T | <input checked="" type="radio"/> |
| f) A scalene triangle is an acute triangle. | T | <input checked="" type="radio"/> |
| g) An isosceles triangle with a 60° angle is an equilateral triangle. | <input checked="" type="radio"/> | F |
| h) A square is a parallelogram. | <input checked="" type="radio"/> | F |
| i) If A, B, C are collinear, then $AB + BC = AC$. | T | <input checked="" type="radio"/> |

2) (10 points)

a) Fill in the blanks: "In an isosceles triangle, the sides of equal length are called the legs." ①

b) Complete the following definitions (Note: The space provided is sufficient!):

An angle is obtuse if its measure is between 90° and 180° . ②

A triangle is scalene if all of its sides are of different length. ②

A trapezoid is a quadrilateral with one & only one pair of parallel sides. ②

c) State the complete precise definition of a circle.

A circle is the set of all points in the plane that are a fixed distance away from a fixed point ③

3) (3 points) Complete the following conversions.

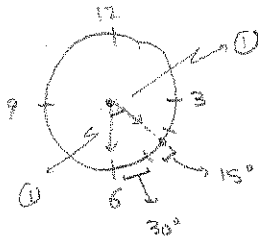
a) $2.35 \text{ km} = \underline{2350} \text{ m}$ b) $758 \text{ ml} = \underline{.758} \text{ l}$ c) $4 \text{ m } 7 \text{ cm} = \underline{407} \text{ cm}$

4) (4 points) Add or subtract in compound units. Briefly show all your steps.

a) $2 \text{ km } 250 \text{ m} + 3 \text{ km } 860 \text{ m} = \underset{\textcircled{1}}{5 \text{ km } 110 \text{ m}} = \underset{\textcircled{1}}{6 \text{ km } 10 \text{ m}}$ (since $1000 \text{ m} = 1 \text{ km}$)

b) $6 \text{ ft } 8 \text{ in} - 4 \text{ ft } 10 \text{ in} = \underset{\textcircled{1}}{5 \text{ ft } 20 \text{ in}} - \underset{\textcircled{1}}{4 \text{ ft } 10 \text{ in}} = \underset{\textcircled{1}}{1 \text{ ft } 10 \text{ in}}$ (used $1 \text{ ft} = 12 \text{ in}$)

5) (5 points) Sketch a clock face showing 4:30 and calculate the smaller angle between the clock-hands.

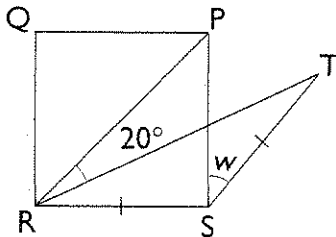


each grid: $\frac{360^\circ}{12} = 30^\circ$ (1)

$\frac{1}{2}$ grid: $\frac{30^\circ}{2} = 15^\circ$ (1)

smaller angle: $30^\circ + 15^\circ = 45^\circ$ (1)

6) (4 points) If $PQRS$ is a square, RST is an isosceles triangle, $RS = ST$, circle the value of $\angle w$.



$\angle PSR = 90^\circ$ (PQRS square)

$\angle PRS = 45^\circ$ ($\triangle PRS$ isosceles right triangle)

$\angle TRS = 45^\circ - 20^\circ = 25^\circ$ } base angles of $\triangle RTS$ (isosceles)

$\angle RTS = 25^\circ$

$w = 180 - (25 + 25 + 90) = 180 - 140 = 40^\circ$

CANCELLED! → choices were printed wrong!

20

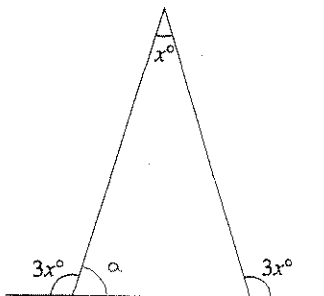
25

40

45

50

7) (8 points) Form an equation in x , and solve the equation, showing the reasoning and facts used.



$a = 180^\circ - 3x$ (\angle s on line) (2)

$3x = x + a$ (ext \angle of \triangle) (2)

$3x = x + 180^\circ - 3x$ (2)

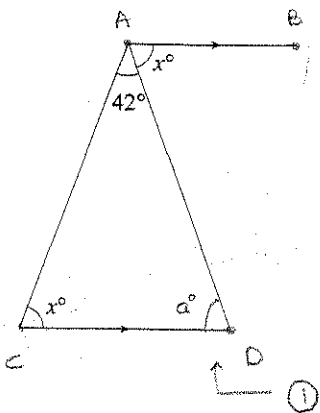
$3x = 180^\circ - 2x$

$5x = 180^\circ$

$x = 36^\circ$

(2)

8) (10 points) Give a Teacher Solution: Form an equation in x , and solve the equation.



$$x = a \quad (\text{int. alt } \angle\text{s, } \overline{AB} \parallel \overline{CD}) \quad (4)$$

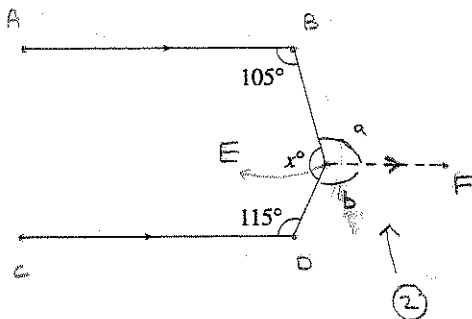
$$x + a + 42 = 180 \quad (\angle \text{ sum of } \triangle ABC) \quad (4)$$

$$2x + 42 = 180$$

$$2x = 138$$

$$\therefore \underline{x = 69^\circ}$$

9) (10 points) Give a Teacher Solution: Find the value of x .



$$a = 105^\circ \quad (\text{int. alt } \angle\text{s, } \overline{AB} \parallel \overline{EF}) \quad (2)$$

$$b = 115^\circ \quad (\text{int. alt } \angle\text{s, } \overline{CD} \parallel \overline{EF}) \quad (2)$$

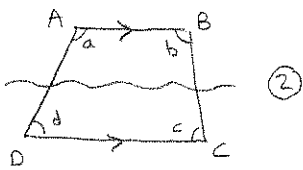
$$x + a + b = 360^\circ \quad (\angle\text{s at a pt.}) \quad (2)$$

$$x + 105 + 115 = 360$$

$$x + 220 = 360$$

$$\therefore \underline{x = 140^\circ}$$

10) (8 points) Teacher Explanation: Draw a series of pictures (with short one-sentence explanations for each picture) to explain the paper-cutting demonstration of "the interior angles in a trapezoid are supplementary".



cut across the trapezoid between the parallel sides } (2)

Then:

I:



Slide along \overline{AD} & align the parallel edges to see $a + d = 180^\circ$ (Ls on line) } (1)


II:




Slide along \overline{BC} & align the parallel edges to see $b + c = 180^\circ$ (Ls on line) } (1)

11) (8 points) Teacher Explanation: Draw a series of pictures (with short one-sentence explanations for each picture) to explain typical mistakes made by students when they first begin using protractors to measure angles.

For a given angle  typical mistakes are:

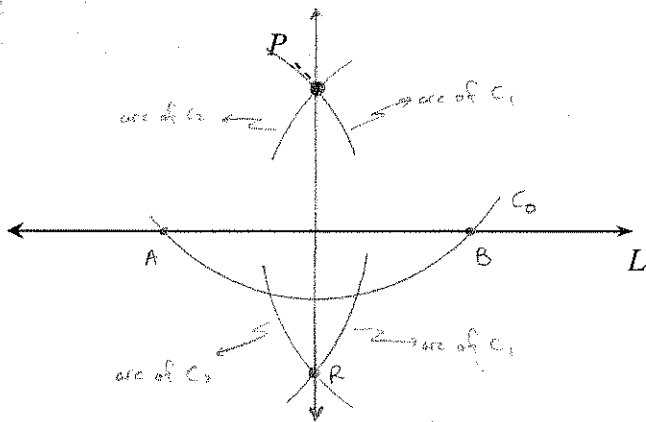
①  the center hole is not aligned with the vertex of the angle! } (3)

②  none of the legs are aligned with 0° on either side! } (2)

③  the wrong scale is being read! } (3)

12) (10 points) Using your straightedge and compass,

a) Construct a line through P , perpendicular to L .



(each step: 1pt)

b) List the steps for the construction, following the format used in class.

1) Draw $C_0(P, r)$ r : any radius big enough so that $C_0 \cap L$ has 2 points

2) Mark A & B on $C_0 \cap L$

3) Draw $C_1(A, |PA|)$, $C_2(B, |PA|)$

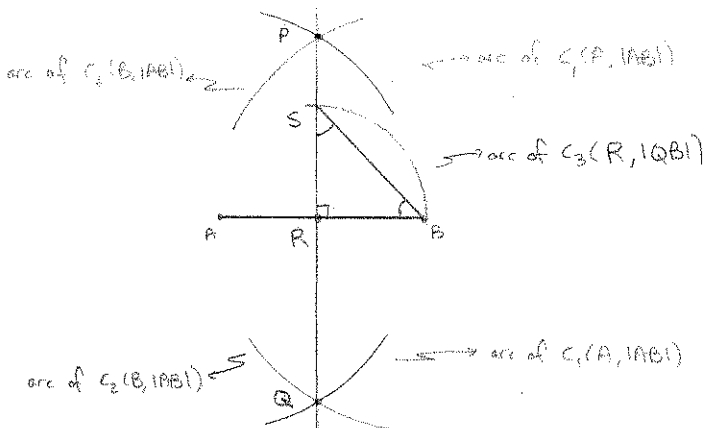
[notice: $|PA| = r$]

4) Mark R on $C_1 \cap C_2$ (P is the other intersection point)

5) Draw \overline{PR}

(each step: 1point)

13) (6 points) Using your straightedge and compass, construct a 45° angle. (List of steps is not required!)



Both $\angle RBS$ & $\angle RSB$
are 45° in measure.

[each step: 1point
Steps: \overline{AB} , C_1 , C_2 , \overline{PQ} , C_3 , \overline{SB}]

14) (5 points) Give a Teacher Solution (with bar diagrams and units) to the following problem:

Kimberly cuts 6 pieces of tape, each $\frac{4}{5}$ m long, from a roll of tape 5 m long.
How many meters of tape are left in the roll?

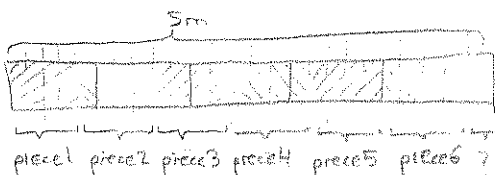


Diagram: 2pts

1 unit: $\frac{1}{5}$ m
6 pieces of 4 units: 24 units) ①

Also: each meter: 5 units
5 meters: 25 units) ①

Left: $25 - 24 = 1$ unit ($\frac{1}{5}$ meter)

$\frac{1}{5}$ m of tape is left. ①