BC Crane Safety

LEVEL 1 MOBILE CRANE
THEORY EXAM PRACTICE QUESTIONS

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INTRODUCTION

The following practice questions are representative of a Level 1 Mobile Crane Theory Exam. These will give you a good idea of how the questions are worded and structured.

Please note that relevant diagrams are included with the practice question wherever possible. There is also an accompanying Level 1 Mobile Crane Theory Exam Practice Question Figure Booklet. Figures from this booklet are referenced in relevant questions as needed. Make sure that you have also downloaded this booklet.

The answer key to all the questions is provided at the end of this document.

PRACTICE QUESTIONS

1. According to Occupational Health and Safety Regulations, what is the minimum distance that must be maintained between a crane and a power line energized with 750v to 75 kv (75,000 volts)?

    a. 3 m (10 ft.)

    b. 4.5 meters (15 feet)

   c. 6 meters (20 feet)

    d. 9 meters (30 feet)

2. What does the hand signal indicate in the figure below?

    a. Boom up

    b. Hoist up

    c. Load up

    d. Hold the swing

3. What is the radio protocol between a mobile piece of equipment and a tower crane sharing the same workplace?

   a. Mobile operator uses the site channel

   b. A separate radio with a mobile to tower crane frequency

   c. Mobile rigger maintains radio contact with tower crane rigger

   d. Mobile operator switches to tower crane frequency once on site

4. What does Part 3 of the WorkSafeBC Occupational Health and Safety regulation cover, if as an operator you are presented with a load to lift that you have concerns about?

   a. Wire rope rejection criteria

   b. Right to refuse unsafe work

   c. Storage of rigging equipment

   d. Weight distribution criteria of lifting devices

5. Using the Pythagorean Theorem, what is the unknown side (c) of the triangle in the figure below?
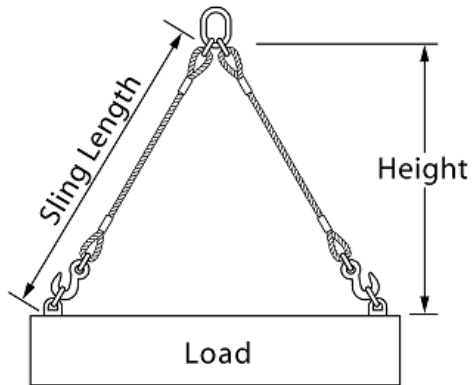
   Pythagorean Theorem: $a^2 + b^2 = c^2$

   a. 9.306 feet

   b. 9.801 feet

   c. 10.296 feet

   d. 12.661 feet
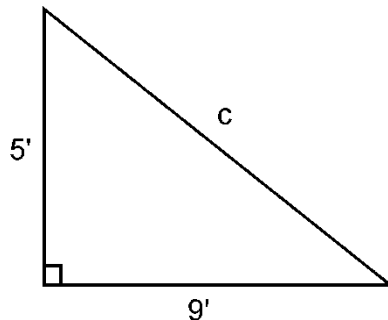
6. What is the load on each sling, when a load is being lifted as in the figure below?

Load Weight = 10,000 Pounds
Sling Length = 10 Feet
Hook Height = 8 Feet

    a. 2,906 Pounds

    b. 3,015 Pounds

    c. 3,125 Pounds

    d. 6,250 Pounds

7. What is the minimum size of the two chain slings required to lift a load weighing 12,000 pounds?

The chain slings are in a double basket hitch configuration at a 60-degree angle.
Refer to Figure 1.

    a. 1/4 inch

    b. 3/8 inch

    c. 1/2 inch

    d. 5/8 inch

8. What is the minimum size of wire rope slings required to lift a load weighing 10,000 pounds?

> The 2 - Leg Bridle Hitch is choked at a 45-degree angle.
> *Refer to Figure 1*.

   a. 9/16 inch

   b. 5/8 inch

   c. 3/4 inch

   d. 7/8 inch

9. Which of the following is NOT an acceptable method for determining the weight of a load?

   a. Load indicator

   b. Bill of lading

   c. Test lifting the load

   d. Calculating the load weight

10. What is the equivalent of 10,030 pounds in kilograms?

   a. 3,057 kg

   b. 3,238 kg

   c. 4,554 kg

   d. 7,650 kg

11. Refer to the figure below. What is the weight of the steel plate in pounds?
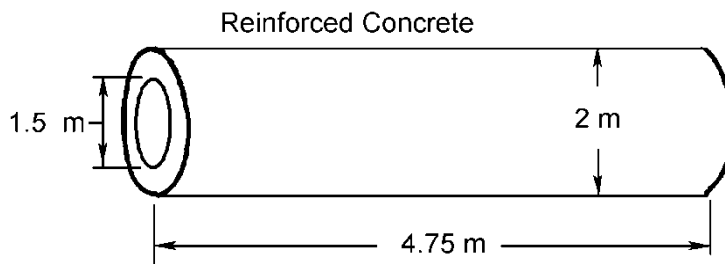
Steel = 490 pounds per cubic foot

    a. 1,673 pounds

    b. 1,899 pounds

    c. 2,112 pounds

    d. 2,207 pounds
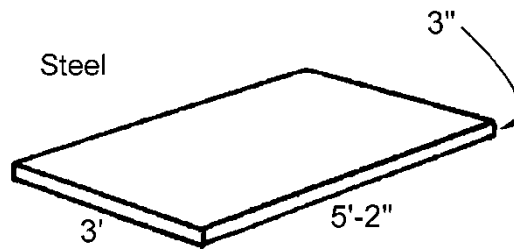
12. Refer to the figure below. When calculating the weight of the heavy wall pipe, what is the volume in cubic metres?

    a. 6.525

    b. 7.643

    c. 8.390

    d. 9.819

13. When must a pre-operational inspection of a crane be done?

    a. Weekly

    b. At the end of the shift

    c. At the start of the day

    d. At the start of each shift

Refer to Figure 2 to answer questions 14-17.

14. What is the net capacity of the crane at a 7.32 metre radius?

> Weight of spreader bar – 75 kilograms
> Weight of rigging – 20 kilograms

    a.   8,105 kilograms

    b.   9,515 kilograms

    c.   10,735 kilograms

    d.   10,830 kilograms

15. What is the maximum radius the gross load can be placed at a height of 5.49 metres?

> Weight of load – 6,200 kilograms
> Weight of rigging – 75 kilograms

    a.   8.23 metres

    b.   9.14 metres

    c.   10.05 metres

    d.   10.97 metres

16. What is the net capacity at a 21 foot radius? The weight of the rigging is 400 pounds.

    a.   7,800 pounds

    b.   10,430 pounds

    c.   17,680 pounds

    d.   23,475 pounds

17. What is the maximum radius the gross load can be placed at a height of 15 feet?

> Weight of load – 12,800 pounds
> Weight of rigging – 350 pounds

    a.   30 feet

    b.   33 feet

    c.   34.5 feet

    d.   36 feet

Refer to Figure 3 to answer questions 18-21.

18. What is the net capacity of the crane based on the configuration below?

> Outriggers and stabilizers extended
> 61 feet of main boom extended
> Lifting with the downhaul weight
> Fixed length jib stowed
> Radius – 30 feet

    a. 4,990 pounds

    b. 5,070 pounds

    c. 5,220 pounds

    d. 5,250 pounds

19. What is the net capacity of the crane based on the configuration below?

> Outriggers and stabilizers extended
> 52 feet of boom extended
> Lifting with the one sheave block
> Extendable jib stowed
> Radius – 38 feet

    a. 3,455 pounds

    b. 3,555 pounds

    c. 4,055 pounds

    d. 4,155 pounds

20. What is the net capacity of the crane based on the configuration below?

> Outriggers and stabilizers extended
>
> 61 feet of main boom extended
>
> Lifting from the 40 foot jib
>
> Lifting with the downhaul weight
>
> Main boom angle – 68 degrees

   a. 1,390 pounds

   b. 1,490 pounds

   c. 1,620 pounds

   d. 1,720 pounds

21. What is the lowest boom angle allowed when placing the gross load based on the configuration below?

> Outriggers and stabilizers extended
>
> 70 feet of main boom extended
>
> Lifting from the 23 foot fixed length jib
>
> Lifting with the downhaul weight
>
> Weight of load – 1,800 pounds
>
> Weight of rigging – 75 pounds

   a. 55 degrees

   b. 60 degrees

   c. 65 degrees

   d. 70 degrees

Refer to Figure 4 to answer questions 22-25.

22. What is the net capacity of the crane based on the configuration below?

> Outriggers fully extended
> 80 feet of boom extended
> Lifting with the 30 ton, 3 sheave block
> 7.5 ton overhaul ball suspended from the auxiliary boom nose
> Weight of rigging – 350 pounds
> Radius – 35 feet

    a. 12,374 pounds

    b. 12,516 pounds

    c. 14,574 pounds

    d. 14,716 pounds

23. What is the net capacity of the crane based on the configuration below when lifting from the main boom?

> Outriggers fully extended
> 90 feet of boom extended
> Lifting with the 30 ton, 3 sheave block
> 26 foot off-settable boom extension erected
> 7.5 ton overhaul ball suspended from the 26 foot extension
> Radius – 25 feet

    a. 12,464 pounds

    b. 12,606 pounds

    c. 12,761 pounds

    d. 13,031 pounds

24. What is the maximum radius the gross load can be placed?

> Outriggers fully extended
> 95 feet of boom extended
> Lifting from the 45 foot tele-boom extension
> Extension offset – 30 degrees
> Lifting with the 7.5 ton overhaul ball
> Weight of load – 2,000 pounds
> Weight of rigging – 100 pounds

   a. 75 feet

   b. 80 feet

   c. 85 feet

   d. 90 feet

25. What is the net capacity of the crane based on the configuration below?

> On rubber, over the side
> 50 feet of boom extended
> Lifting with the 15 ton, 2 sheave block
> 7.5 ton overhaul ball suspended from the auxiliary boom nose
> Weight of rigging – 150 pounds
> Radius – 18 feet

   a. 7,209 pounds

   b. 7,351 pounds

   c. 13,279 pounds

   d. 13,429 pounds

Refer to Figure 5 to answer questions 26 to 29.

26. What is the gross capacity based on the configuration below?

Radius – 155 feet

Length of jib – 262 feet

2 parts of line

Gear 2

    a. 10,980 pounds

    b. 13,975 pounds

    c. 15,740 pounds

    d. 15,785 pounds

27. What is the net capacity based on the configuration below?

Radius – 213 feet

Length of jib – 279 feet

Weight of concrete bucket – 450 pounds

2 parts of line

Gear 3

    a. 7,440 pounds

    b. 7,890 pounds

    c. 8,300 pounds

    d. 8,750 pounds

28. What is the net capacity based on the configuration below?

Radius – 50 m
Length of jib – 75 m
Weight of rigging – 160 kg
2 parts of line
Gear 2

   a.   6,180 kg
   b.   6,740 kg
   c.   6,980 kg
   d.   7,530 kg

29. What is the maximum radius the gross load can be placed based on the configuration below?

Length of jib – 70 m
Weight of load – 7,600 kg
Weight of rigging – 115 kg
2 parts of line
Gear 1

   a.   50 m
   b.   55 m
   c.   57 m
   d.   60 m

ANSWER KEY

1. According to Occupational Health and Safety Regulations, what is the minimum distance that must be maintained between a crane and a power line energized with 750v to 75 kv (75,000 volts)? **Answer: A**

2. What does the hand signal indicate in the figure below? **Answer: A**

3. What is the radio protocol between a mobile piece of equipment and a tower crane sharing the same workplace? **Answer: B**

4. What does Part 3 of the WorkSafeBC Occupational Health and Safety regulation cover, if as an operator you are presented with a load to lift that you have concerns about? **Answer: B**

5. Using the Pythagorean Theorem, what is the unknown side of the triangle in the figure below? **Answer: C**

   Formula: A squared plus B squared = C squared

   A squared = 25

   B squared = 81

   25 plus 81 = 106

   The square root of 106 is 10.296 (rounded off to the third decimal place)

6. What is the load on each sling for a load rigged as in the figure below? **Answer: D**
   Formula to determine the load on each sling leg:

   $$\frac{\text{Load (W) x Sling Length (L)}}{\text{\# of slings x Hook to Load Height}}$$

   10 x 10,000 = 100,000

   2 x 8 = 16

   100,000 ÷ by 16 = 6,250

7. What is the minimum size of chain slings required to lift a load weighing 12,000 pounds? **Answer: B**

   There are two slings being used in a double basket hitch.

   The capacity of one, 3/8 inch sling at a 60 degree angle is 9,838 pounds.

   9,838 x 2 = 19,676 pounds, which is more than the weight of the load.

8. What is the minimum size of wire rope slings required to lift a load weighing 10,000 pounds?
   Answer: C

   When a 2-Leg Bridle is choked the listed capacities must be reduced (multiplied by .75).

   The capacity of a 3/4 inch, 2 leg bridle is 14,400 pounds.

   14,400 X .75 = 10,800 pounds, which is more than the weight of the load.

9. Which of the following is NOT an acceptable method for determining the weight of a load?
   Answer: C

10. What is the equivalent of 10,030 pounds in kilograms?   **Answer: C**

    1 pound = 0.454 kilograms
    10,030 X .454 = 4,554

11. Refer to the figure below. What is the weight of the steel plate in pounds? (Steel = 490 pounds per cubic foot)   **Answer: B**

    Formula: length x width x thickness x unit weight.

    Change all measurements to feet.

    3 inches = 0.25 feet (3÷ 12 = 0.25)

    5 feet, 2 inches = 5.167 feet (62 ÷ 12 = 5.167)

    Length x Width x Thickness x Unit Weight

    3 x 0.25 x 5.167 x 490 = 1,899 pounds

12. Refer to the figure below. What is the volume of the heavy wall pipe in cubic metres?
    Answer: A

    To determine the volume of the heavy wall pipe, calculate as if the object were a solid shape and then subtract the volume of the "hole".

    Formula:

    <u>3.14 x diameter x diameter x length</u>   minus   <u>3.14 x diameter x diameter x length</u>
              Divided by 4   Divided by 4

    3.14 x 2 x 2 x 4.75 ÷ 4 = 14.915 cubic metres

    Minus the volume of the "hole". Use the same formula as above.

    3.14 x 1.5 x 1.5 x 4.75 ÷ 4 = 8.390 cubic metres

    14.915 - 8.390 = 6.525 cubic metres

13. When must a pre-operational inspection of a crane be done? **Answer: D**

14. What is the net capacity of the crane at a 7.32 metre radius? **Answer: A**

    The gross capacity at a 7.32 metre radius is 8,200 kilograms. The weight of the spreader bar and the rigging must be deducted from the gross capacity to determine the net capacity. 8,200 minus 95 = 8,105 kilograms

15. What is the maximum radius the gross load can be placed at a height of 5.49 metres?
    Answer: C

    Gross load: 6,200 plus 75 = 6,275 kilograms. The gross capacity at a 10.05 metre radius and a height of 5.49 metres is 6,520 kilograms. The gross capacity is greater than the gross load of 6,275 kilograms.

16. What is the net capacity at a 21 foot radius? The weight of the rigging is 400 pounds.
    Answer: C

    The gross capacity at a 21 foot radius is 18,080 pounds. The weight of the rigging must be deducted from the gross capacity to determine the net capacity. 18,080 minus 400 = 17,680 pounds

17. What is the maximum radius the gross load can be placed at a height of 15 feet? **Answer: B**

    Gross load: 12,800 plus 350 = 13,150 pounds. The gross capacity at a 33 foot radius and a height of 15 feet is 14,375 pounds. The gross capacity is greater than the gross load of 13,150 pounds.

18. What is the net capacity of the crane based on the configuration below? **Answer: B**

    Deductions from gross capacity
    Downhaul weight   180 pounds
    Fixed length jib stowed   150
    Total deductions   330 pounds

    The gross capacity at a 30 foot radius is 5,400 pounds.
    5,400 minus 330 = 5,070 pounds
    The net capacity is 5,070 pounds.

19. What is the net capacity of the crane based on the configuration below? **Answer: A**

Deductions from gross capacity
One sheave block   375 pounds
Extendable jib stowed   270
Total deductions   645 pounds

There is no capacity for a 38 foot radius so we must use the next longer radius to determine gross capacity.
The gross capacity at a 40 foot radius is 4,100 pounds.
4,100 minus 645 = 3,455 pounds
The net capacity is 3,455 pounds.

20. What is the net capacity of the crane based on the configuration below? **Answer: C**

Deductions from gross capacity
Downhaul weight   180 pounds

There is no capacity listed for a 68 degree boom angle so the next lower boom angle must be used to determine gross capacity.
The gross capacity at a 65 degree boom angle is 1,800 pounds.
1,800 minus 180 = 1,620 pounds
The net capacity is 1,620 pounds.

21. What is the lowest boom angle allowed when placing the gross load based on the configuration below? **Answer: C**

Gross load to be lifted
Downhaul weight   180 pounds
Load   1,800
Rigging   75
Gross load   2,055 pounds

The gross capacity at a 65 degree boom angle is 2,400 pounds which is greater than the gross load of 2,055 pounds.

22. What is the net capacity of the crane based on the configuration below? **Answer: A**

Deductions from gross capacity
3 sheave block   580 pounds
7.5 ton overhaul ball   354
Auxiliary boom nose   142
Rigging   350
Total deductions   1,426 pounds

The gross capacity at a 35 foot radius is 13,800 pounds.
The deductions of 1,426 pounds must be subtracted from the gross capacity to determine net capacity.
13,800 minus 1,426 = 12,374
The net capacity is 12,374 pounds.

23. What is the net capacity of the crane based on the configuration below when lifting from the main boom? **Answer: B**

Deductions from gross capacity
3 sheave block   580 pounds
26 foot extension erected   2,960
7.5 ton overhaul ball   354
Total deductions   3,894 pounds

The gross capacity at a 25 foot radius is 16,500 pounds.
The deductions of 3,894 pounds must be subtracted from the gross capacity to determine net capacity.
16,500 minus 3,894 = 12,606
The net capacity is 12,606 pounds.

24. What is the maximum radius the gross load can be placed? **Answer: B**

Gross load
7.5 ton overhaul ball   354 pounds
Load   2,000
Rigging   100
Gross load   2,454 pounds

The gross capacity at an 80 foot radius is 2,460 pounds which is greater than the gross load of 2,454 pounds.

25. What is the net capacity of the crane based on the configuration below? **Answer: A**

Deductions from gross capacity
2 sheave block   425 pounds
7.5 ton overhaul ball   354
Auxiliary boom nose   142
Rigging   150
Total deductions   1,071 pounds

The gross capacity at a 20 foot radius is 8,280 pounds.
The deductions of 1,071 pounds must be subtracted from the gross capacity to determine net capacity.
8,280 minus 1,071 = 7,209
The net capacity is 7,209 pounds.

26. What is the gross capacity based on the configuration below? **Answer: B**

There is no capacity listed for a radius of 155 feet. The next longer radius must be used to determine gross capacity. The gross capacity at radius of 164 feet and a jib length of 262 feet is 13,975 pounds.

27. What is the net capacity based on the configuration below? **Answer: A**

The gross capacity at a radius of 213 feet and a jib length of 279 feet is 7,890 pounds.
The weight of the concrete bucket must be deducted from the gross capacity to determine net capacity.
7,890 minus 450 = 7,440
The net capacity is 7,440 pounds.

28. What is the net capacity based on the configuration below? **Answer: C**

The gross capacity at a radius of 50 m and a jib length of 75 m is 7,690 kg.
But, the hoist is in gear 2 which has a maximum capacity of 7,140 kg.
Deduct the weight of the rigging from the hoist capacity.
7,140 minus 160 = 6,980 kg
The net capacity is 6,980 kg.

29. What is the maximum radius the gross load can be placed based on the configuration below? **Answer: B**

Gross load to be lifted:
Load - 7,600 kg
Rigging - 115 kg
Gross load - 7,715 kg
The gross capacity at 55 m radius and a jib length of 70 m is 8,140 kg which is higher than the weight of the gross load.