
Stepping Stone

Name: _____

Date: _____

Description:

The project is useful for landscaping. Measurements of the right amount of Portland cement, water, sand, and coarse aggregates will be used to construct this project.

Materials:

Portland cement
Sand
Coarse aggregate
Water
Wood frame (form) (2" deep)
Adhesive contact paper
Colored Glass
Non-stick spray or diesel
Newspaper
Scissors
Pencil
Tape measure
Framing Square
3 measuring pitchers (2000 ml)
Safety goggles
Dust mask

Tools:

Wheelbarrow
Hammer
Paint brush
Mortar Hoe
Concrete Float
Bull Float
Concrete Edger
Trowel
Screed board (2 ½ scrap 2x4)

Procedure:

1. Measure the inside of the form and measure the adhesive paper to fit the inside of the frame.
2. Spray the inside of the frame with non-stick spray or swipe with diesel using a paint brush.
3. Cut out the adhesive contact paper the size of the inside of the pan.
4. Peel the paper off of the contact paper and lay the adhesive side up. This will hold the glass pieces.
5. Make a composition using the colored glass pieces and place the glass pieces on the adhesive part of the contact paper.
6. Place the contact paper (with the glass design facing up) inside the lubricated frame.
7. Make sure you protect your work surface. Lay down some roofing felt or plastic sheeting before mixing the concrete.
8. Mix concrete 1:2:2 parts by dry volume. That is: one part Portland cement, two parts sand and two parts coarse aggregate. **While mixing make sure to wear safety goggles and a dust mask, be aware of dust particles.**
9. Use 1500 ml Portland cement, 3000 ml sand, 3000 ml gravel.
10. Add water CAREFULLY to the mixture, and mix with mortar hoe until an oatmeal texture is achieved.
11. Carefully pour the concrete mixture into the frame.

12. Use a scrap of lumber to screed the form, move it back and forth in a sawing motion. Tap the form with a hammer on all sides to settle the concrete in to the form.
13. Use a wood float to settle the concrete. Do not over work.
14. Let sit until the top is dull.
15. Use the edging towel to finish the edges and a steel trowel to smooth the surface.
16. **WASH ALL TOOLS THOROUGHLY.**
17. Let the stepping stones dry for at least 3 days.
18. Remove from the form.

Notes:

Photo/Drawing:

Example patterns.



Form (frame)

Table 32.3—Quantities of Cement (C.), Fine Aggregate (F.A.), and Coarse Aggregate (C.A.) Required to Make 1 Cubic Yard of Compact Mortar or Concrete¹

Mixture			Resulting Volume of Concrete in 1-Bag Batch	Quantities Required for 1 Cubic Yard of Compact Mortar or Concrete				
C.	F.A.	C.A.		Cement	F.A. (Sand)		C.A. (Pebbles, Stone)	
<i>Bags</i>	<i>Cu. Ft.</i>	<i>Cu. Ft.</i>	<i>Cu. Ft.</i>	<i>Bags</i>	<i>Cu. Ft.</i>	<i>Cu. Yds.</i>	<i>Cu. Ft.</i>	<i>Cu. Yds.</i>
1	2		2.1	12.8	25.6	0.95		
1	1½	3	3.6	7.6	11.4	0.42	22.8	0.85
1	2	3	3.9	7.0	14.0	0.52	21.0	0.78
1	2	4	4.5	6.0	12.0	0.44	24.0	0.89
1	2½	4	4.8	5.6	14.0	0.52	22.4	0.83
1	3	5	6.4	4.6	13.8	0.51	23.0	0.85

Concrete mix table

Stepping Stone Worksheet

Name: _____

Date: _____

1. You are building a concrete structure that will be used in a swine gestation barn where each stall is 26" wide and there are two rows of 20 stalls in the barn. Assuming a 10% waste factor, how many total cubic yards of concrete will be needed?(2pts)

2. If concrete cost \$96 per cubic yard delivered, what is the total amount that the concrete will cost? (2pts)

3. How much cement, sand, and gravel will be required if you mix it yourself for the above project? Use a 1:3:5 mix. (Hint: see table on the handout.) Assume that you purchase the cement in 1cu. foot sacks, sand and gravel are purchased by the cu. yard. (6pts)

Cement: _____ Sacks

Sand: _____ Yds.

Gravel: _____ Yds.

Grading Rubric:

<u>CRITERIA</u>	<u>POSSIBLE</u>	<u>SCORE</u>
Craftsmanship	10	
Overall Quality of Stepping Stone	5	
Cleanup (tools)	5	
Calculations (worksheet)	10	
Total	30	

Stepping Stone Teachers Notes:

Agricultural Standards Met:

15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

6.2 Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.

6.5 Use tools and machines safely and appropriately.

B1.2 Know the relationship between accepted shop management procedures and a safe working environment.

B6.1 Understand how to accurately calculate volume, materials needed, and project costs for a concrete or masonry project.

B6.2 Know proper bed preparation, concrete forms layout, and construction.

B6.3 Complete a concrete or masonry project, including developing a bill of materials, assembling, mixing, placing, and finishing.

Objectives:

By properly completing this project, students will be able to:

- Properly mix concrete.
- Develop a stable stepping stone that will stay intact.
- Identify concrete tools.

Alternative Tools/Methods/Materials:

- Aluminum backing pans can be used for forms (Dollar store)
- Concrete mixer can be used instead of hand mixing.
- Redi-mix can be used in place of mixing the concrete, but then the students will not learn the skills about mixing concrete.
- If the students want the decorations to be on the top, finish the concrete and then press the decorations in the design they want. They will not need adhesive paper if the project is done this way.
- A wide variety of decorative glass, rock, etc, can be used. Be creative. Ideally you need something fairly flat.

Forms:

Forms are reusable. However they also make a good project. The form is constructed to be used multiple times. The frame is made of a 2"x4" or 2" x2" scraps and OSB board for the bottom. The frame is a 12"x12". The frame is held together by screws on the side and on the bottom. This way if

the frame is not lubricated enough then the students can simply unscrew it and get the stepping stone out.

Safety Review:

- Dust- Make sure to wear safety goggles at all times during this project.
- Wear a dust mask when mixing the Portland cement, sand, and gravel so you don't inhale the particles.

Project Time:

Demonstration:	30 minutes
Build:	2 hours

Demonstration Notes

1. To have the students complete finishing the concrete, they will have to come back to the agriculture department 1-2 hours later. Finishing concrete takes 7-10 minutes; the students could come on their lunch break or possibly after school.
2. The wooden frame can put together with wood screws or duplex nails. The frame can easily be unscrewed or the nails and can be pounded out. This way the stepping stone can easily come out of the frame if not lubricated properly.
3. If the students do not want to decorate the stepping stone they can make one without glass pieces. They are still learning the process of mixing and finishing concrete.
4. Make sure to tap the concrete into the frame, especially the corners. This way you have a solid stepping stone without holes in it.
5. A concrete mixer could be more useful when the whole class is doing the project. This way not every student needs a wheel barrow. If you don't have a concrete mixer, put the students into groups of 4 or 5 and have the students calculate the concrete ratio and mix it together.

Bill of Materials:

Projects:	24					
Size	Description	Units	Qty/Project	Cost/Unit	Order	Amount
1/2"	OSB	4'x8'Sheet	0.039171	\$12.83	1	\$ 12.83
2x4	fir	12' board	0.053819	\$3.74	2	\$ 7.48
60 lb.	Portland Cement	bag	0.044444	\$4.57	2	\$ 9.14
60 lb.	Gravel	bag	0.044444	\$ 3.73	2	\$ 7.46
40 lb.	Sand	bag	0.05	\$2.98	2	\$ 5.96
#6 x 1 5/8"	Bugle head wood screws	100/box	0.08	\$ 3.00	2	\$ 6.00
	Colored glass beads or ????				0	\$ -
					TOTAL	\$ 48.87

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